SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

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Original Correspondence.

VISIT OF THE IRON AND STEEL INSTITUTE TO SHROPSHIRE—No. II.

Among inventors whose names are very little known is that of Gilbert Gilpin, who took out a patent for chains for winding purposes at the beginning of the present century, and who was awarded a purse of 30 guineas and a silver medal by the Society of Arts. He was a friend of the Wilkinsons, and was at one time in the service of the elder brother John, whom he left in the year 1776, but who sought to re-engage him, as may be seen by the following letter, which we have by us, with many others, both of Gilpin and of the Wilkinson's. Gilpin's letter is dated Bersham, March 26, 1796, and is as follows :—

"Sir,—It was my intention to have answered your note of Thursday last in person, but have been prevented by a severe cold and pain in my limbs. Unless the business which is to be transacted on the Continent is of such magnitude as to enable you to give an agent 150*l.* sterling, exclusive of travelling charges, I shall prefer my prior intention of attempting to have a small foundry in France, either by myself or in Co., the moment a peace takes place. I have not the least idea that you will give any such salary, because I know there are numbers of persons who will do it for less, and it is this circumstances that prevented me from offering my services at the time I first heard of your intentions thereon.—I am, Sir, your most humble servant, GILBERT GILPIN."
"John Wilkinson, Esq."

Mr. Gilpin did not, as he anticipated, go to France, but engaged himself to Mr. Botfield, of the Old Park Ironworks; here he entered upon experiments which resulted in his discoveries in chains for winding purposes. The steam-engine was just then beginning to supersede horse labour in winding, as it is called, which had been accomplished previously either by a jack-weight drawn down an inclined plane, or by means of a machine called a gin. Four horses or less, as the case may be, were yoked to as many cross-pieces of wood fixed in an upright shaft, passing at the upper end through a barrel sufficiently high for the ropes to clear the horses' heads, such as may now be seen where depth of shaft is trifling, or the work but temporary. The steam-engine (or sawney, as it was called by way of derision) was soon found cheaper and more effective than horses, and capable of bringing up with much less risk loads from a greater depth than they had yet ventured. The chain was made to work upon a barrel cylindrical, or formed on a double cone plan, as it were, base to base. The slipping of one coil from the other, or confusion caused by irregular wrappings round the barrel, not unfrequently caused accidents; to prevent which Mr. Gilpin constructed grooved pullies, turned upon the lathe, for the links to fit in, and barrels upon which were coiled spiral iron "tire," between which the chain fell into position, so that each fold was at an equal distance from the other. The paper prepared by Mr. Gilpin for the Society of Arts, which was ably written, and well illustrated throughout, gives a description of his newly-invented cranes, and thus proceeds :—

"Although the method of working chains in grooves had been in use three years and a half at the time this paper was drawn up (1807), and T. W. and B. Botfield had nearly 2000 ft. in daily motion at their manufactory, yet not a single link had broken, or the least accident occurred therefrom. The wear was so trifling that it appeared that chains would sooner fail from oxidation than attrition, for although the machines for raising coal and ore from the mines are in use 12 hours in the day, the brown oxide of iron formed upon the links by exposure to the atmosphere is seldom disturbed by the motion of the chain. It is probable, therefore, that in this manner of working chains will last at least 15 years, but to be certain it is taken at 12 in the subjoined comparative statements, which show that the expense of chain as cordage is not a fourteenth part of that of hempen ropes."

It was added that, in this statement the superiority of chains is so far from being over-rated that there is every probability the expense of them will be less than the twenty-fourth part of the hempen ropes.

The method of folding wooden barrels with wrought-iron tire does away with the necessity of cast-iron ones, and may be applied to every wooden barrel now in use at a small expense, as may be seen from the following estimate :—

Statement of the expense of tarred ropes for a machine for raising coal and ore from a pit 80 yards deep for three years and four months :—

Ten ropes, each 110 yards long, 6 in. in circumference, and 5 lbs. per yard, 550 lbs., at 8d. per lb.	£183	6	8
Deduct ten worn-out ropes, 2750 lbs., at 1d. per 1 lb.	11	9	2
	£171	17	6

Expense of ropes for three years and four months, 171*l.* 17s. 6d."

Expense of chains for the same machine, and for the same time :—

"Two chains, each 110 yards long, formed of ⅜ in. iron, 28 links to the yard, and weighing 5 lbs. per yard, 1100 yards, at 6d. per 1 lb.	£27	10	0
180 yards of wrought-iron tire, with holes punched therein, weighing 7 lbs. per yard, at 1s. 6d. per yard..	13	10	0
540 nails for tire, 27 lbs., at 1s. 6d. per 1 lb.	13	6	
Workmanship nailing the tire on the barrel, 180 yards, at 2½d. per yard	1	17	6
	£43	11	0

The pecuniary reward, as we have said, Mr. Gilpin received from the Society of Arts for his invention was 30 guineas. This sum was sent down in a purse now before us. Underneath the date 1805 is "Society of Arts," in gold letters, surmounted by heraldic devices, and having "Gilbert Gilpin" printed underneath. The copper "tokens" as they were called, issued by Gilpin were of a really superior class; around the rim, in a band on either side, is "Gilbert Gilpin, Dawley, Shropshire, pay the bearer a halfpenny." In the centre is a finely-executed crest of a wild boar, having 1811 underneath. The centre, on the opposite side, sets forth that the above-named gentleman "sells chains for pits, cranes, &c., of best horse-nail iron at 5d. per pound." A silver token, very nicely got up, bears the same inscription.

Justice to Mr. Gilpin and his invention compels us, before quitting this branch of the subject, to notice one or two evils it was his object to obviate, and to fortify our view of its merits by an extract from the *Mechanic*, a very respectable authority of that day. The old oval linked chain, in use for common purposes from very remote times, had in it a twist, arising from the weld of the iron. Ropes used in mining and other operations were apt, by coiling irregularly, to slip, and consequently to break. To obviate the latter evil in chains Mr. Gilpin caused grooves, cast in his iron pulleys with a tire of just sufficient dimensions to receive those links of the chain that work vertically, while those working horizontally, and what may be called the gudgeon part of it, were made to bear upon each side of the grooves. Barrels of cast-iron were also provided, with spiral grooves of the same dimensions, at such a distance from each other as to admit the chain to bed without the danger of a double coil. By these means the links were retained at right angles with each other, the only position for free and uniform motion. The links of the chains are made as short as possible, for the purpose of increasing their flexibility, and they are reefed perfectly free from twist in the pulleys and on the barrels, for the same reason. The paper in the *Mechanic*, from which we gather these remarks, says :—

"When applied in blocks the grooves in the pulleys prevent the different folds of the chain from coming in contact, and render plates between them (as in the common way) totally unnecessary. The pulleys are in consequence brought closer together, the angle of the fall from block to block considerably diminished, and the friction against the plates avoided. Brass guards, with grooves opposite to those in the pulleys, are rivetted to blocks, to prevent the chain getting out of its berth from any accidental circumstance. This method of working chains was first put in practice at the ironworks of T. W. and B. Botfield, near Shiffnall, and employed in the working of cranes capable of purchasing from 10 to 15 tons, in the working of the governor-balls of the steam-engines constructed by Boulton and Watt, and in the raising of coal and ore from mines, for which purpose ropes have before been solely used. The chains in all cases have performed with the utmost safety, uniformity, and flexibility, so much so that the prejudices of the workmen against them are entirely done away with, and the heaviest articles are hoisted with more ease, and as great confidence of safety, as with the best hempen ropes."

With a view of ascertaining the relative flexibility of ropes and chains, the friction, and power requisite to move certain weights, a table detailing experiments made with each is given. The paper then proceeds :—

"Contrary to the general opinion, it also appears that chains are safer than ropes, for it is an established axiom that those bodies whose fibres are most in the direction of a strain are the least liable to be pulled asunder; and in the examination of the properties of a rope, we find that the strands cross the direction of the strain in undulating lines, and, consequently, prevent its uniform action thereon. A rope is subject to this inconvenience even when stretched in a direct line, but more particularly so when bent over a pulley, as in that position the upper section, moving through a greater space than the under one, is acted upon by the whole strain, and hence the frequent breaking of ropes in bending over pulleys, from the double strain overloading the strands of which the upper section is formed. The links of a chain are subject to the transverse strain, where they move in contact; but as such strain is in proportion to the length of the bearing, it must be very trifling. All the links having axles of their own, the chain moves simultaneously with the strain, and both are, in consequence, retained in continual equilibrio. A chain in grooves will, therefore, sustain as great a weight when bent over a pulley as it will in a direct line, and is, consequently, safer than a rope. A safe, uniform, and flexible method of applying chains in the working of machinery has long been a desideratum in the arts, for they are but little affected by exposure to the weather or the heat of manufactories, whilst either produces the speedy destruction of ropes. The discovery is of additional importance, as it substitutes a durable article for a very perishable one, and gives employment to our manufactories at the expense of foreign importations. The durability is at least six to one in favour of chains."

The flat chain of the present day was an improvement, and an after invention, in consequence of a 50*l.* prize offered by Mr. Reynolds, of Ketley, for that purpose. The improvement was brought out by Mr. Banks, and like the former, was patented. Instead of single links, it consisted, as is well known, of three of these parallel with each other, every other set being tightly held together by wooden blocks, the latter having small nails driven in at the ends, to prevent them slipping.* Orders soon poured in from all parts of the kingdom for iron chains for lead and copper mines, coal shafts, cranes, cables, and for other general purposes. Mr. Gilpin continued still to be looked up to and consulted upon matters connected with the iron trade.

* The latter invention is also claimed for Mr. Benjamin Edge, father of Mr. James Edge, and grandfather of Messrs. John and Joseph Edge, chain manufacturers, of Coalport, in 1812.

BIRMINGHAM, AND THE BLACK COUNTRY.

INTENDED VISIT OF THE IRON AND STEEL INSTITUTE TO SOUTH STAFFORDSHIRE.

A complete programme of the arrangements made for this visit has now been sent to the various members of the Institute, and others interested. The papers mentioned in the South Staffordshire Trade Report of last week's *Mining Journal* will be read and discussed. We will now notice the more important places to be visited by the mining engineers. The Earl of Dudley's No. 26 Pits, Tividale, will be the first; here extensive explorations have been made in search of the Thick coal beneath the Rowley Hills. These hills are composed of basalt or igneous rock, and stand not far distant from the Silurian projection upon which Dudley is built, so that they are entirely surrounded by the coal measures. This range of basaltic hills extends about two miles in length, and averages one mile in width, and rises to an elevation of about 300 feet above the surface of the surrounding coal field, the highest summit being 700 feet above the level of the sea. For many years men of some experience in mining matters held the opinion that these hills were a mere igneous waste, and that no coal would be found even near the outer edge of this over-capping basalt, but this was an erroneous idea, as some of the best collieries in the Black Country have their workings under the edge of the hills; and from the results obtained at two sinkings we are about to mention, it seems probable that Thick coal in some shape or other exists under nearly the whole of the range. The central pipe, or as it is sometimes termed mushroom stalk, up through which the molten lava, or liquid "trap," must have poured, has not yet been discovered.

At the No. 26 Pits, Tividale Colliery, the depth to the Thick coal is 232 yards, but in driving towards the principal cone of the basalt it is found that a series of downthrow faults bring the coal down more than 100 yards; so that, allowing for the additional height of the summit of the central boss of trap, and the additional depth at which the coal is thrown down about that point, it makes the total depth through the Thick coal nearly 400 yards. In sinking the present pits no basalt *in situ* was met with, although it is to be seen at the surface at a very short distance from and all round the pit tops. Large boulders of basalt were, however, occasionally met with in a bed of variegated marl, 40 yards thick, which immediately underlies the surface soil. These purple marls (from which the celebrated South Staffordshire blue bricks are made) are, doubtless, derived from decomposed trap, for they are present all round the range of Rowley Hills. The true coal measures lie under these marls, and in sinking the beds were found very little disturbed. Quantities of highly explosive gas were given off when the Thick coal seam was neared, and the latter was found much altered in its nature. The Gubbin and White ironstones, which lie immediately below the Thick coal, were found to be much altered, and rendered quite porcelanic. Two beds of green rock, or injected trap, were sunk through in the measures of the above ironstone, and the presence of these would account for the changes that had taken place. These pits are sunk from nearly the summit of the hills, and although there have been great difficulties to overcome in following the Thick coal, because of its contorted state, and the frequent injections of trap, which render it exceedingly difficult; still, for all this, the industrious mine agent, Mr. Thomas Latham, has succeeded in finding here and there a fair area of unaltered Thick coal, so that large quantities continue to be raised. The visitors will not descend these pits, as it would be too much of a toil to traverse the uneven roads which follow the coal, so that they will only see the surface plant and hear the workings of the pits described.

The winding is done by a horizontal engine, 40-horse power, geared to a 14-ft. diameter drum. Round wire-ropes are used, and the pits are furnished with wire-rope conductors or guides. The pit frames are exceedingly massive and strong, and are surmounted by large skeleton pulleys, composed of wrought-iron arms and cast-iron rims and bosses. A small beam engine stands near the mouths of the pits, and is used for drawing the tubs of coal out of the "dip," or "deep," in the pits. The wire-rope passes down the shaft and over pulleys placed in the gate-roads. The coal is conveyed down a very long incline to the Conygre Furnaces and the canal wharf, and a small horizontal engine is fixed on the pit bank, at the head of this incline. The party will go from these pits to those of Mr. Samuel Minton, which have been sunk from almost the highest peak of the basaltic range, and the Thick coal has been reached at a depth of about 280 yards. No trap was met with in sinking, yet the shafts are within 60 yards of columnar basalt, *in situ*. Here there is a fine pair of coupled horizontal winding-engines, which no doubt will do good work in bringing up the coal.

It is to be regretted that it is only in a few instances that this class of winding plant may be found in South Staffordshire, although its advantage is so well known. It is also probable that one or other of the basalt quarries will be examined. The late J. Beete Jukes says of these Rowley Hills that there are to be seen occasionally on the slope of the hill just below the basalt some considerable beds of trappean breccia, or brecciated ash, containing rounded and angular fragments of igneous rock lying in a brown, rather ferruginous paste, that looks like the debris of a basaltic rock. If these beds be connected with the basalt, which seems almost certain, it shows that the basalt was an eruptive rock, poured out at the surface in the form of a sheet of lava, whether subaqueous or subaerial, immediately after the formation of the part of the coal measures which lie below it. These trappean breccias, or conglomerates, belong to and pass into the coal measures, and, therefore, the basalt of the Rowley Hills also belongs to, and forms part and parcel of, the coal measure series. That it was formed during the coal measure period seems also probable, from the fact that it has been subsequently affected by all dislocations and other accidents that have happened to the coal measures.

IRONWORKS AND COLLIERIES IN YORKSHIRE.

THE DARFIELD MAIN COLLIERY.

Of the collieries working what is known as the Barnsley Thick coal there are few where there are the same specialities, or where more has been done to ensure the safety of the workmen, than at Darfield Main. The managers a short time since introduced the steam jet gas exhaust and propeller for lighting the bottom of mines, and of which they are the patentees, and the example thus set has been followed in several other mining districts, so that the new system has become an admitted success. The tail-rope for drawing the corves along the roads and inclines has also been extensively adopted, whilst the viewer, Mr. Wilson, is well known in connection with some valuable experiments, continued up to a recent period, as to the value of miners' safety-lamps, and the time they take in exploding when placed in an atmosphere charged with gas travelling at a certain rate. The colliery itself is situate about four miles from Barnsley, near to the Wombwell Station of the South Yorkshire Railway, to which there is a branch line from the pit bank. At the top there are all the usual requirements necessary: there is a small gas-works, by which the top and bottom is lighted, and in the fitting shops there is a small engine for working the lathes. In the smiths' shops there are four fires, kept alive by fan blast, together with a steam-hammer to economise manual labour. In a large building near to one of the shafts there is an engine with a pair of 18-in. cylinders, ready in case of an accident occurring either to the cage or corves, or in the event of the rope giving way, for the purpose of drawing the men out; the necessity for such a precautionary measure having taken place last year, when the workpeople had to remain some hours in the pit by an accident. In a shed another engine is kept at work for the circular saws, the fires in the smiths' shops, and for grinding the horse corn.

There are two shafts, the downcast being 11 feet in diameter inside the tubbing, or 95 cubic feet area, and the upcast 10 feet 2 in. in diameter inside the tubbing. Under the pit hill is a small engine working a set of 6-in. pumps, and forcing the water 60 yards up the shaft from a drift where it is collected. The same engine is also used for raising the timber required to the top of the shaft, as well as for other purposes. There is only one bed of coal worked, the Barnsley, which is about 337 yards from the surface, although there are other seams which in all probability will be got, more especially the Wathwood, which is about 160 yards from the surface, and nearly 4 ft. in thickness. The following is a reduced section of the strata :—

	Yds.	ft.	in.
Clay, stone, and bind	31	0	6
Coal and shale	2	2	6
Red rock in partings	29	0	0
Bind and stone	30	2	2
Newhall coal, with dirt	0	3	9
Fire-clay	2	2	4
Stonebind and bind	18	1	5
Wath Wood, or Melton rock	34	0	11
Stone and band	18	2	5
Wath Wood, or Melton coal	0	3	10½
Stone and bind	13	0	11
Half-yard coal	0	1	5
Coal and shale	10	2	10
Abdy coal	0	2	7
Spavin, bind, &c.	34	0	9
Kent thin coal	0	2	1
Blue stone and bind	36	1	2
Kent thin top coal	0	1	6
Dirt and coal	1	2	11
Strong cank and stone	64	2	3
Barnsley thick coal	0	8	0
Total	337	1	3½

There is a double-decked cage, and the winding engine is a horizontal one of 60-horse power, with two 30-in. cylinders, drawing four corves at a time, weighing each 14 cwts., the weight on the rope being 4½ tons, pulling from the bottom, a distance of 337 yards, in one minute and a half. There are nine boilers, six of them being 36 ft. long, four of the latter are 4 feet 6 in. in diameter, and two 5 feet

diameter. The other three boilers are 48 feet long, and 4 feet 6 in. in diameter, the working pressure being 45 lbs. to the square inch. The pulleys are 14 feet in diameter, working round wire-ropes attached to a new head gear, 45 feet in height.

Descending the shaft we find the bottom brilliantly lighted as far as the stables and landings, and the corves being drawn along from the furthest part of the workings. The means by which the gas is supplied are at once simple and effectual, and unlike the methods to be found at collieries where gas has been introduced, some of which require from 1000 to 1500 gallons of water to be forced down every hour to obtain a sufficient supply for a moderate sized pit, and requiring a water-guage at the bottom. By the patent of Messrs. Huntriss, Swinburne, and Wilson, however, by means of an infinitessimally small steam-jet a steady and bright light is obtained, whilst the quantity of waste water is small, and there is always plenty of gas at the overflow pipe at the bottom of the pit, which is not usually the case when the gas is taken down either by water or other pressure. We believe that the first time that gas was taken into a colliery was about 26 years ago, at Trimdon Grange, Durham, when Mr. Wilson assisted in laying it. Since then it has been put down most of our large collieries, but the expense has not led to its adoption in many small ones. Leaving the gas apparatus, our attention was drawn to the tackling for pulling the corves to the bottom of the pit. In the first place there is an engine made by Pigott and Farrar, of Barnsley, in 1866, having two 18-in. cylinders, with 3-ft. stroke, three drums, and a place for a fourth one if required. It is used for drawing the coals out of the dips, having a rope 2¼ in. in circumference. The length of the main rope in the dips is 1200 yards; the tail rope on the slant being 3500 yards long, and the main rope on the slant 1300 yards long. With regard to the extent of the plane we may state that the distance from the bottom of the shaft to the No. 1 landing was 264 yards; to No. 2 landing 638 yards; to No. 3 landing 792 yards; to No. 4 landing 800 yards; to No. 5 landing 900 yards; and to the No. 6 landing 1100 yards. The journey to and from the different places named with 20 ¼-ton corves occupies from 8 to 12 minutes only, the gradients varying from 1 in 36 to 12 in 36, the angles which have to be passed being from 16° to 50°. The engine working the rope receives its power from two boilers, one 15 feet by 5 feet, and the other 48 feet by 4 feet 6 in., the pressure being 35 lbs. to the square inch.

The arrangement for working the tail rope on the slant side is very good, and gives an excellent idea of the advantages of the system, although there are a great many wagon-roads at right angles to each other, the dips being on a line with the engine, and the slants at right angles from it. There are two drums to work the slant side, one for the tail and the other for the main rope. The tail rope is taken from the drum round a 6-ft. sheaf, and along the side of the road into the in end of the plane, and then brought back again round another 6-ft. sheaf to the shaft siding or pass-by. It is then coupled to the corves or tubs, and taken to the far end of the plane, with the main rope attached to the outer end of the corfs. The tail rope is then put on to the full tubs at the in end, and the main rope hooked on to the outer end of them when they are brought on to the shaft and landed in the pass-by. Mr. Wilson termed the mode as above given in his own terms as the main and tail rope systems combined. The number of corves on each set of ropes was 34 ½-ton ones, the distance from the shaft to the dip slant first landing was about 800 yards, to the far landing 924 yards, and to the end 1012 yards. There are two corves to go round to and from those landings, where the horses and ponies each take a load from the smaller pass-byes, and thence the trammers take the empties to the working places of the colliers to be filled.

The colliery finds employment for upwards of 500 men and boys, the output being nearly 5000 tons a week, and for which there is a very good demand for the London and other markets, the coal being of excellent quality. The pit, we may say, is ventilated by means of an ordinary furnace, having an area of 64 feet; and with the aid of the engine fires there are about 130,000 cubic feet of gas passing through the workings every minute. The pit is much troubled with faults, varying from 1 ft. to 103 ft., entailing a considerable expense in timber to prevent falls of the top, and large quantities are sent down daily to maintain the roads in an efficient state. The coal has been got on what is known in the Barnsley district as "leading and following up bank;" but we found the men working on the long wall system, carrying all the coal away, and building stone pillars instead of leaving the natural strata to support the roof. Where the coal had been taken away the roof appeared to be very good indeed. In one place the men were working the "end banks," and holing 6 ft. under, when the "spraggs" were taken away, the coal falling from 30 to 40 yards in length. As a rule the coal fell in large marketable pieces. The "end banks," it was stated, were being worked at Denaby Main and Darfield only. The Stephenson and an improved Clanny lamp are those used in the pit.

As before stated, Mr. Wilson has devoted much time to the question of safety-lamps, having tested almost every description known, both with colliery and ordinary gas, and as the subject is one of the greatest importance to all persons engaged in mining operations the results of his experiments cannot fail to be of interest. It would appear from the investigation made that there is no real safety-lamp, for under certain conditions they will all explode. On the occasion of a thorough testing of the different lamps in use, in the presence of a considerable number of mining engineers, Mr. Wilson gives the results as follows, with an explosive mixture, and the velocity being at the rate of two and a half miles per hour:—

The Belgian lamp exploded in	1	minute	35 seconds
The Mozard lamp exploded in	1	,,	50 ,,
The Davy lamp exploded in	0	,,	13 ,,
The Clanny lamp exploded in	0	,,	23 ,,

In the second test, the velocity being four miles an hour—

The Belgian lamp exploded in	0	minute	15 seconds
The Davy lamp exploded in	0	,,	7 ,,
The Stephenson lamp exploded in	1	,,	10 ,,
The Mozard lamp exploded in	0	,,	12 ,,
The Clanny lamp exploded in	0	,,	4 ,,

At the rate of four and three-quarters miles—

The Belgian lamp exploded in	0	minute	13 seconds
The Davy lamp exploded in	0	,,	5 ,,
The Clanny lamp exploded in	0	,,	12 ,,
The Mozard lamp exploded in	0	,,	6 ,,
The Stephenson lamp exploded in	0	,,	8 ,,

Several lamps brought by mining engineers, as being prized by them, followed the fate of the others. Mr. Foster, of London, had a Defiance lamp tested, but Mr. Wilson states, although he was down the pit with him, he had never heard of him or his lamp since. Another gentleman, Mr. White, of Middlesex, also sent a lamp, which was christened the "Cockney," but it gave way, although it stood well for some time.

In concluding our notice of the Darfield Main Colliery, we can say that there is much that is interesting to be seen in it; and should any person feel interested in the working of the patent gas apparatus, or the tail and main ropes, we have no doubt but what they will receive every courtesy at the hands of the respected manager and the other officials.

Tunnelling and Coal-Cutting.—The invention of Mr. W. Low, Wrexham, consists of drills, chisels, or cutting tools set upon shafts ranged so as to correspond with the particular form of tunnel or heading to be driven, leaving the centre part of the machine free for the carrying off of material got away. These shafts are actuated by wheel work set upon other shafts, so as to render the whole system capable of being actuated simultaneously from one source of power, whether hydraulic, steam, compressed air, or otherwise. Trams for running back the machine can be used, and side rails to facilitate motion; the mode of action being by drilling a number of holes in straight lines on three sides of the tunnel, heading, or drifting. The machine is so constructed that wagons can be taken through it to the forebreast to remove the same, which may be thrown down within the space perforated by the drills or augers, either by blasting, sawing, or otherwise. If the material acted upon be coal, then, by adopting the plan of sawing, the coal may be taken out in convenient-sized blocks without subjecting it to the great loss which arises from the large amount of slack produced by the blasting and in the carriage and handling of irregular pieces of coal.

Treating Peat.—Mr. T. G. Walker, New York, proposes to make use of a current of superheated steam to heat and expel the volatile material. The peat is introduced into a mixer, or pug mill, surrounded with a jacket into which the steam and vapours pass from the other portions of the apparatus so, as to warm the contents of the pug mill, and at the same time the vapours are condensed and the water runs away. A boiler and furnace are provided, and the steam from the boiler passes through the fire space in a pipe or coil, and acts upon the peat at the bottom of the pug mill to blow the same in small pieces, lumps, or in a reduced form through a pipe to the receiving vessel, and by pressure this pipe should also pass through the fire, in order that the peat may be additionally heated. The action of the superheated steam is to heat the peat, and sometimes carbonise the same, so that the moisture thereof passes off as soon as it arrives at the receiving vessel, and the vapours circulate through a pipe to the jacket aforesaid surrounding the pug mill. The peat is delivered by a piston that forces the same out of the receiving vessel through a tube or nozzle. The peat or other material may be in such a condition that when it is heated in a closed vessel by superheated steam or otherwise, and allowed to discharge therefrom in a heated state into another vessel, the vapours will pass away from the same, and a piston is employed to force the peat out of such vessel.

THE COLLIERS' STRIKE IN SOUTH WALES.

Sir,—Herewith you will receive a copy of an agreement this day entered into between Mr. Matthews, solicitor, on behalf of the colliery owners, and Mr. Stephens, solicitor, on behalf of the workmen.

You will be pleased to observe that by this agreement the strike is put an end to, and in the course of a day or two it is expected that all the pits will again be at work. Alex. Dalziel,
Secretary of the South Wales Steam Coal Collieries' Association.
Cardiff, Aug. 21.

FORM OF AGREEMENT.

Disputes and differences as to rates of wages, duration of hiring, mode of working, and other matters, having arisen between the proprietors of the above collieries and the colliers and other workmen connected therewith, it is hereby agreed that all such matters in difference shall be referred to the arbitration and award of two persons, one to be appointed by each party (and their umpire), provided that in fixing the rates of wages and prices the arbitrators and their umpire shall be governed by the rates paid for similar descriptions of work at other collieries and works raising steam coal in Monmouthshire and South Wales, that such arbitration shall be proceeded with and concluded (within the space of six months from this date) in conformity with the provisions of the Common Law Procedure Act, 1854, that the award of the said arbitrators or umpire shall be binding upon the parties hereto for the space of six months from the date of resuming work, and that 5 out of every 100 men employed in each pit shall be at liberty in each month, on giving the usual month's notice, to quit their employment, the proprietors having a similar power of discharge, notwithstanding that such men may have signed this agreement.

That pending the making of such award, the colliers and other workmen shall resume work, being paid draws on account at the usual times, and in the customary manner, based upon the rates of wages paid for the month of May, 1871, the excess or reduction being accounted for by the parties respectively, on the award being made.

That the parties shall respectively bear their own costs of the reference, and that the costs of the umpire shall be borne equally between them. Dated at Cardiff, this 21st day of August, 1871.

Signed, for and on behalf of the steam coal colliery proprietors,
Benjamin Matthews, solicitor.

Signed, for and on behalf of the colliers and workmen,
Thomas H. Stephens, solicitor.

Witness to the signatures of both parties, Alex. Dalziel.
Cardiff, Aug. 22.

THE COAL COMMISSIONERS' REPORT.

Sir,—After reading the excellent epitome of the report on the Coal Fields of Great Britain and Ireland, in the Supplement of the *Mining Journal* for Aug. 12, it must be admitted the information conveyed in the report is very valuable, and has, no doubt, been drawn up with great care as regards the quantities still available in our coal fields. The calculations make the coal available to the depth of 4000 ft. to be 146,480 millions of tons. Of this quantity 56,273 million tons is estimated to lie under the newer formations, the remainder being what may yet be obtained from proved coal fields. Again, we have calculations as to the quantity which may be got from a depth beyond 4000 ft. It appears there are only five districts which are supposed to yield coal beyond this depth, and in these, from 4000 to 6000 ft. depth, a further quantity of over 29,341 million tons is calculated to exist.

But taking into account the increase in the temperature of mines with the depth, and the cost of machinery for raising coal, it may be safely assumed that in practice the depth of 4000 ft. will never be exceeded in coal working, and for all practical purposes the 146,480 million tons will be the quantity available for the future. The calculations, it will be observed, include all thin seams, and deductions for loss in working have been made in conformity with the practice of different districts. Ordinarily this loss is about 10 per cent., but it frequently amounts to 40 per cent. of the whole coal; this calls for some investigation in the face of the extensive drain made yearly in our coal fields. It is admitted there is good prodigality in many cases in the working of coal, and there is much more generally in its combustion, since we know that engines about coal mines ordinarily consume as much as 10 lbs. of coal per horse per hour, whilst the most approved engines now constructed consume only from 2 to 3 lbs. of coal per horse per hour.

If the yearly production of coal is to be kept down at 115 million tons the question of waste, both in working and combustion, will have to be looked into. It is well known if the prevention of smoke were better attended to the latter would be greatly checked. With the production at 115 million tons per year we have a prospect of a supply for 1273 years on the calculations given in the report. But with a production increasing each year, as it has done for some years past, and supposing this not to be diminished by scarcity and the dearness of fuel, the duration would be comparatively limited, or about 276 years. But an increasing yearly production would doubtless be greatly modified, or altogether prevented, if legislative measures were instituted to prevent the waste in working coal and its combustion; and, as this is a truely national question, we trust it will have due and careful consideration.

There is no estimate given in your tables of the coal lying under the German Ocean, east of the Northumberland and Durham coal field. Can any reader inform us if this has been included in the calculation, as a very large area of coal seams is supposed to exist there, as yet but little worked? C. V.

UTILISATION OF WASTE COAL.

TO THE EDITOR OF THE TIMES.

Sir,—The voluminous extracts from the report of the Government Commission on the resources of the supply of coal in this country, which recently appeared in the *Times*, and your leading article relative to it, induce me to address you on the subject of utilising the millions of tons of dust coal yearly withdrawn from our mines, and hitherto considered almost useless. My attention has for some years been directed to the means of employing bitumen to raise the illuminating power of coal gas, and it has been used with advantage in retorts mixed loosely with large coal.

I have, however, found that by heating dust coal and mixing it to the extent of about 83 per cent. with about 17 per cent. of bitumen, &c., and forming the amalgam into blocks, there is produced, when treated in retorts in the usual manner, 9600 cubic feet of 21-candle gas, and 13½ cwts. of coke, which is stated to be of good quality.

The above results, which gave much satisfaction, were obtained from trials conducted with great care in the excellent laboratory of Mr. Porter, of Lincoln, under the joint superintendence of that gentleman and of Mr. Silverthorne.

This proposed method of utilising waste coal and of producing gas of a high illuminating power will, I hope, be of sufficient interest for you to allow the subject space in your journal.

18, *Parliament-street, Aug.* 19. Arthur A. Cochrane.

UTILISATION OF WASTE COAL.

Sir,—Admiral Cochrane's suggestion that coal-dust may be used with an admixture of bitumen for obtaining gas of high illuminating power is unquestionably a good one. A similar use is made of coal-dust mixed with coal oil or shale oil. But coal-dust is in the best possible form for giving off its gas rapidly, and if the mixtures referred to be used it is a mistake to consolidate the amalgam into blocks. The only condition necessary is that the charge should be exposed in thin layers to the action of heat in the retorts. This we accomplish by passing the fine coal or the mixture through short retorts of very small diameter, which act like the tubular steam-boiler for rapid distillation, exhausting the charge in about one-fifth the time occupied by the heavily-charged bulky retorts in common use. These small retorts are self-feeding and discharging continuously, without any escape of gas or heat. Porter and Lane,
172, *Fenchurch-street, Aug.* 21. Gas Engineers.

UTILISATION OF WASTE COAL.

Sir,—As my name is mentioned by Admiral Cochrane in connection with an extensive series of experiments upon the admixture of coal and bitumen, conducted by Mr. J. T. B. Porter, of Lincoln, and myself, within the last three weeks, will you allow me to state that the firm of "Porter and Lane, gas engineers," were in no manner associated with the experiments referred to by Admiral Cochrane?

Arthur Silverthorne, C.E.
3, *Craven-street, Charing Cross, Aug.* 23.

IRON SMELTING—THE FERRIE FURNACE.

Sir,—The collapse of "No. 1 Ironmaster" is sudden and complete. I will, if you please, decline to accept his challenge to prove positions I have never taken up. "No. 1 Ironmaster's" denial in the coke from Scotch coal question can avail little in the face of his rejection of the simple crucial experiment I proposed. It would, perhaps, puzzle him to think of a more efficient experimental retort than the tobacco-pipe, and his pronouncing it not sufficiently practical is on a par with his own authority—Mr. Hunter—becoming *no authority* whenever his figures were on the wrong side for "No. 1 Ironmaster." Smelter.

EXPLOSION AT COLOGNE.

Sir,—This afternoon we had an explosion in the magazine where we kept our detonators, some 900 feet away from our lithofracteur factory at Kalk. In this magazine a case containing several thousand detonators exploded, without, however, doing any other damage than injury to the building. Through an accident there happened to be four cases of lithofracteur in an adjoining chamber, about 15 feet away. These had been sent down a few minutes before from the factory to await arrival of cart to be taken to the Rhine for shipment. These cases of lithofracteur remained uninjured, being a confirmation of our statements in respect to its safety. The explosion of the detonators was a very sharp one, and we conclude must have arisen through their having been tightly packed in a case filled with wet sawdust, and we assume that the heat of the weather must have caused the sawdust to fire. We have only to add that the magazine was locked, and the key in the pocket of our manufacturing director, Prof. Engels.—*Cologne, Aug.* 17. Gebr. Krebs and Co.

NOVEL RAILWAY ARRANGEMENTS.

Sir,—As some of your readers may be interested in this—one of the culminating achievements of modern mechanical skill—I take the liberty of explaining in a non-scientific manner the railroad to Rigi-Kulm. First, as regards the engine. It is a small locomotive, very much smaller than any I have seen in England, being somewhat like one of the stationary engines employed in the erection of large buildings, placed on wheels. There are three rails, the two outer ones like an ordinary railroad, and the third placed between them. This third one is cogged, as is also the driving wheel. The engine pushes the carriage before it, and as the carriage has a break, and is unconnected with the engine, any accident that may occur to the engine, causing it to rush away in descending, would not necessarily affect the safety of the passengers, except, perhaps, a shock to their nervious system. The carriages are very neatly arranged, on the simplest principles; no windows, but latticed casements, which may be drawn up or down as the weather may be stormy or clear. During our journey we required to have them down, as the rain fell in torrents. The seats are arranged with the back to the ascent, thus enabling the passengers to view the ever-changing beauties of the landscape.

There is only one carriage to each train, which contains about 60 passengers; but as the number of passengers far exceeds the calculation of the projectors, two more trains are put on, each starting five minutes after the other.

These at present make the journey four times a day, but no doubt the increasing popularity of the line will induce the projectors to provide additional accommodation. There is one station half-way up the line—Kaldbad—where the train stops each way. It is simply a large hotel, capable of accommodating 400 or 500 persons, who go there, I suppose, for the benefit of the baths—as the name of the place implies. The incline of the railway is varied as the nature of the particular parts of the mountain demands. Sometimes it is as much as one in four, but generally less. The time the train takes in making the ascent is from three-quarters of an hour to an hour, and the descent the same. The fare is somewhat exhorbitant, but under the peculiar circumstances it is not to be objected to—5 frs. each journey.—*Rigi-Kulm, Aug.* 18. Traveller.

THE ROYAL COMMISSION ON SCIENTIFIC INSTRUCTION, AND THE ROYAL SCHOOL OF MINES.

TO THE EDITOR OF THE TIMES.

Sir,—You are aware that a Royal Commission was appointed not long ago to consider the subject of Scientific Instruction, &c. It was suggested by the British Association for the Advancement of Science, and is believed to have emanated from a compact little "caucus" of philosophers, desirous of persuading the Chancellor of the Exchequer to assist in what is termed "the promotion of science." One of the first acts of the Commission was to enquire concerning the Royal School of Mines, and to issue a report recommending the disruption of the institution known as the Museum of Practical Geology, and the transference of the School of Mines to South Kensington, to be there merged, or rather submerged, in what is designated a General Science School. But the collections illustrative of geology, mineralogy, mining, and metallurgy, which form an important part of the teaching apparatus, were to remain in Jermyn-street, along with the extensive library, which has been expressly formed for the use of students of those and certain other allied sciences, and the existence of which library was unknown to certain influential members of the Commission when they issued their first report.

Reasons against the adoption by the Government of the recommendations of the Commission were submitted to the Education Department, in a letter which was signed by the Lecturers on Geology, Mineralogy and Mining, and Metallurgy, and by the Keeper of Mining Records. The letter, or as it may henceforth be termed, for the sake of distinction, the memorial, was referred to the Commission, who deputed three of their members to report upon it—a manufacturer, a physiologist, and a mathematician; and the product of their joint labours is contained in a parliamentary paper recently published. They have not even attempted to answer some of the most important arguments advanced by the lecturers, such as the advantage of the connection of the library with the teaching department, and of the central position of the Institution to the general public; and the replies which they have given to the other objections are, as I shall, with your permission, endeavour to show, for the most part easy to be disposed of.

In reply to the allegation in the memorial that the proposals of the Commissioners involve great expense to the nation, and that the additional accommodation required can be obtained in Jermyn-street at a moderate cost, the Committee state that it is in evidence that the cost of extension in Jermyn-street would be very great; whereas the Government possesses a building at South Kensington affording all necessary accommodation.

The question here arises, what is meant by "extension?" The word may be used in one sense by the Committee and in a widely different sense by the memorialists. The Keeper of the Mining Records asserts that in the existing Institution in Jermyn-street there is ample accommodation for additional records during many years to come, notwithstanding it is alleged by the Commissioners in their first report that the space allotted to the Mining Record Office is already insufficient for the proper reception and arrangement of the valuable documents accumulated there. The Lecturer on Mining and Mineralogy declares that he is perfectly satisfied with the space devoted to his department. The Lecturer on Geology, as such, requires no increase of space; but, as Director of the Geological Sur-

vey, he needs additional room, which might easily be provided, at a comparatively small cost, in the immediate vicinity of the collections which have to be frequently consulted. The Lecturer on Metallurgy thinks it desirable somewhat to increase the dimensions of the metallurgical laboratory for the practical instruction of the students in assaying, as he has been repeatedly obliged to decline the application of students for admission from want of space; but this, he says, may be obtained in the existing institution at a very small outlay compared with what would be necessary in the event of removal to South Kensington.

With regard to the statement that the building at South Kensington affords all necessary accommodation, the authorities of the Science and Art Department have never communicated with the lecturer on metallurgy concerning a metallurgical laboratory, and no special provision has been made in the new buildings for such a laboratory, though a chemical laboratory has been constructed under the direction and supervision of the lecturer on chemistry. The Commissioners have, however, presumed to take upon themselves the responsibility of assigning a particular part of those buildings for a metallurgical laboratory, in which numerous furnaces are required, demanding the utmost care in their construction to provide against the contingency of conflagration. The present metallurgical laboratory assigned to the students holds not more than 10 persons, but by doubling its capacity, which might be done by an outlay not exceeding 200*l.*, it would probably be found large enough for many years to come.

The memorialists are of opinion that it is not desirable to separate the Mining School proper from the other departments now situated in Jermyn-street; but the Committee dissent therefrom on several grounds. They say it is impossible, without great cost, to let things remain as they are, and that the association of the school and a main part of the teaching apparatus is of less importance in their eyes than what they call "the consolidation of the school" at South Kensington. This is mere opinion. I and others who claim to have better means of judging on this subject than the Committee deny the accuracy of their statement as to cost, and in proof are prepared to adduce something more substantial than opinion. Consolidation is a grand and captivating word, but what does it mean, anything or nothing?

The Commissioners did not dare to urge their scheme of consolidation so far as to recommend the transference of the working men's lectures to South Kensington; and, as copious illustrations are needed for those lectures, they prudently refrained from meddling with the Museum. The great lecture room is generally filled to overflowing with artizans, not fewer than 600 in number, and any interference with their privileges would be quickly resented.

Now, Sir, let me direct your particular attention to the following sentence in the Committee's report:—"The evidence given before the Commission shows more especially that there is a great disadvantage in dissociating the chemical laboratory from the geological and metallurgical work." The Committee either knew that there existed a laboratory exclusively devoted to metallurgical work, and wholly independent of the chemical laboratory in Oxford-street, or they did not know it.

If they knew the fact, what is to be said of their candour in having suppressed it, and if they did not know it, what is to be said of their ignorance of it? But one of them, and several of the other Commissioners, were certainly not ignorant of it.

The memorialists expressed their apprehension that if the Royal Schools of Mines should be merged in a general science school it might lose its definite and distinctive character, and that the confidence of the mining interest in its value might in consequence be severely shaken.

In answer the Committee state:—

"That for the last 18 years the average number of students who, having been examined in mining or mineralogy, have subsequently been employed in the Geological Survey and in the mines and metal works of the United Kingdom, has, according to a table put in evidence, been less than four per annum."

And they somewhat sarcastically remark,—

"If, notwithstanding the eminence of the Professors, the mining interest has been very slow to avail itself of the advantages afforded by the school, this may be owing, in great degree, to the imperfection of its organisation, and to the incompleteness of the preparation which it supplies for the professions of mining and metallurgy, owing to the entire absence of instruction in mathematics, and, as a necessary consequence, imperfect teaching of applied mechanics and machinery. The Committee believe that these defects will be in a great measure remedied by the proposed association of the School of Mines with that of Naval Architecture and Marine Engineering, and that the appreciation of the technical education afforded in the school, far from being diminished, may be fairly expected to increase."

There are, Sir, two classes of students at the Royal School of Mines—the matriculated, who pass through regular courses and examinations; and the occasional and more numerous class who devote their time exclusively to the study of one or two special subjects. The Committee refer only to the former class, and make no allusion to the latter. Thus, the students of both classes who have received instruction in metallurgy, theoretical or practical, average between 18 and 19 per annum since the commencement in 1851, and in recent years their number has notably increased. They are distributed throughout the country, the colonies and dependencies, and other parts of the world, many of them filling with great credit very responsible positions; and a record of the history of each since he left the school has, so far as practicable, been preserved. What I here affirm is true, and can, if necessary, be proved to be true. The Committee have exposed themselves to the charge either of want of fairness or want of knowledge. They are in a dilemma, and may choose the horn which is most agreeable to them.

A school of mines, let it never be forgotten, should be wholly special in its character, and its students should acquire their mathematical knowledge before they enter it. But if, when the school in Jermyn-street was first established, and for many years afterwards, candidates for admission to it had been required to exhibit proof of adequate mathematical training, many would certainly have been repelled; and it was hoped that as time advanced mathematical education would become much more widely diffused.

In the case of students intending only to study certain subjects, such as assaying, mathematical training is unnecessary. Mathematical knowledge is apt to be paraded as all-important by persons who are not mathematicians; and pure mathematicians, who may never have made a single successful application of their knowledge in their lives, are too often inclined to imagine that no progress can be made in any branch of science without their assistance.

The Committee admit the force of the objection urged by the memorialists, that it is not desirable to separate their teaching from the illustrative collections in the Museum of Practical Geology, but they cannot allow it, they say, to outweigh the other considerations which they have advanced. They have learnt, they tell us, that the specimens belonging to the Musuem are very rarely exhibited in the lecture-room. That allegation, however, is to a considerable extent simply untrue. Many of the most important illustrations are of large dimensions, and practically irremovable. Although they cannot be set upon a lecture-table, yet they are referred to and explained, and immediately after a lecture the students are enabled to examine them as well as the specimens which are permanently exhibited in cases, and which are generally much more useful to students than those which appear for an hour on the lecture-table. But imagine the models and many other illustrations in Jermyn-street and the teaching at South Kensington.

The Committee announce their belief that one or more collections on a smaller scale, adapted for the illustration of lectures, could without difficulty be provided for the school, but they would have rendered useful service by informing us how, where, and at what cost such illustrations of mining and metallurgy may be procured. They are entirely mistaken on this point, having had no personal experience of what is required for that purpose.

You will, Sir, I think, agree with me that on such a question as the disruption of the Institution in Jermyn-street, and the removal of the School of Mines to South Kensington, the opinions of the memorialists, who have officiated as the teachers of mining, metallurgy, and geology at the Royal School of Mines from its commencement, are deserving of at least as much consideration and confidence as those of the Commission.

It is essential to keep in view the great distinction between preparatory training for instruction in mining and metallurgy and the instruction itself. Let the former, which embraces general chemistry, physics, and mathematics, find a home at South Kensington, but let the special branches of instruction relating to geology, mining, metallurgy, and practical mechanics remain where they are in Jermyn-street.

That the school is capable of improvement there can be no doubt, but that will not be effected by its banishment to a western suburb; it requires to be freed from certain associations, and to be supplemented by the addition of teachers in two or three important and intimately related departments of science.

At present it should be known that persons continually visit the Museum of Practical Geology in order to seek information concerning the nature, value, and mode of occurrence of ores or other minerals occurring in their own estates or elsewhere, and to consult the collections of the Museum, when they are often successively introduced to the officers of the institution who have specially studied the various subjects involved in the enquiry. But should the proposals of the Commissioners be carried out, that advantage will be completely lost. A visitor bringing a specimen for examination will be obliged to proceed to South Kensington in order to ascertain its value and composition, and afterwards travel to Jermyn-street to learn all the geological and other particulars concerning it, a course not quite in accordance with the notions of a practical Englishman of the present day.

It is to be hoped that Her Majesty's Goverement will hesitate before adopting the recommendations of the Commissioners, not one of whom has any title to speak with authority concerning the subjects on which they have reported with so much confidence; and it satisfactory to know that the Marquis of Salisbury and Mr. Fletcher have obtained promises from the representatives of the Education Department in the House of Lords and the House of Commons respectively, that no action shall be taken by the Government on the recommendation of the Royal Commission concerning the Royal School of Mines without previously affording Parliament ample opportunity of discussing it.

An error was committed in the selection of some of the Commissioners, for three of them were personally interested in the results of their enquiries, and two of those were avowedly antagonistic to the School of Mines, on the ground that, being partly supported by the Government, it competes unfairly in certain branches of teaching with the private institutions with which they themselves were connected.

Royal Commissions have sometimes ended in smoke and sometimes in jobs. In the event of the realization of the scheme of absorption and consolidation previously referred to it is not difficult to predict one result. A fat and easy berth will be created, to become, perhaps, the subject of eager competition among popular expositors in science or experts in after-dinner speeches before aristocratic audiences. The successful candidate may then pass the remainder of his life in sublime repose. ——— Y.

SCIENCE AND THE EMPIRIC ART INSEPERABLE IN MINING.

SIR,—In the Supplement to the Journal of July 1st, "Critic," in his rejoinder to my letters of June 17 and 24, asks—"Why call the art of mining 'the empiric art?'" If he has submitted that question to me for solution my answer is "I do not know; let him who has so called it furnish the explanation." I simply stated—as the heading of this paper will show—that science and the "empiric art" were inseparable in mining. And I repeat that in its physiological departments it is pre-eminently so. By the physiology of mining I mean the nature and condition of its lodes and cross-courses, together with their containing rocks, and their mutual relations one to the other. The intersection of metalliferous veins and their dislocations by porphyry and other dykes, as well as by the ordinary cross-courses and faults, has been and still is a subject of anxiety to the miner, and of equally serious consequences to the capitalist. In using the term empiric art I make no reference to the art of mere pretence, but to that acquired by experience, and restricted to the phenomena so constantly recurring in the underground departments of mining.

In my articles bearing on this subject I as readily admit the application of scientific principles to mining as "Critic" does; but I repeat that in its physiological department no "rules" or "principles" of science are applicable, and I invite him who contends for the opposite to point out in what way. What is the reason—let those who can answer—that no rules susceptible of general application can be established by which the direction of displacement of our metalliferous veins may be determined on their intersection by cross-courses? It is well known that what holds good in one district fails utterly in another, and sometimes in districts which are contiguous to each other. Is it conceivable that by any other means than observation this most important part of mining knowledge can be acquired? I do not think the charge can be preferred, or if preferred sustained, that sufficient attention has not been given to this subject. It has engaged, perplexed, and baffled the ingenuity and comprehension of both practical and scientific men alike at all times and in all countries. I should like to be informed how if a solution of the difficulty cannot be determined in the mines it can be taught in the schools, or propagated through the medium of books?

So much being said now-a-days about the application of scientific principles to mining, it would be interesting to know in what departments of practical mining scientific principles, where applicable, are either excluded or rejected. I speak advisedly when I say I know of no such departments; and "Critic," who assumes that the converse of my position is correct, would do well to adduce some evidence in favour of his assumption.

The sciences pertaining to mining are all nearly, if not entirely, included in the three following divisions—the mechanical, including mathematics, chemistry, and geology. The two former, it can never be affirmed, on sufficient basis, are in any way restricted in their application to mining, except by pecuniary difficulties; whilst the latter—geology—being a science of observation and induction, has been inseparably associated with mining from the earliest times. It matters not whether it was known by that or any other name. The progress of geology, and its advancement to admission amongst the sciences, reflects the greatest credit on the talent, intelligence, and assiduity of its votaries; yet at the same time it must be admitted that up to the present it has not been able, from all the facts of its observation, to deduce and establish a set of rules which have any direct application to individual mining enterprise.

So far as my observations are concerned, I cannot but conclude that those who talk most of the necessity of employing scientific principles to mining know least about the business and its requirements. They do not seem to be aware that all the aid which science can lend to the art of mining has been accepted. The subject recently discussed in the columns of the Journal respecting the necessity of imparting a technical education to the miner generally had not so much for its object, I apprehend, the inauguration of a new set of sciences as the dissemination of those known by experience to be applicable.

The first important part of mining is its physiological conditions and associations, from which its present and prospective value has to be determined—positively or comparatively, as the case may be. The next important consideration is the arrangement or plan for the most economical development; following, and by no means less important, is its multifarious details, the importance of which, in an economical point of view, cannot be over estimated. The physiological conditions of a lode, or series of lodes, cannot at all times be determined by either experience or science exclusively, and both are not unfrequently called upon to contribute to this result; but of the two experience is the most important, because it apprehends the scientific part involved—the determination of intrinsic value by chemistry. I presume "Critic" will not undertake to affirm that this branch of science has been neglected in its application to mining.

The next stage of practical mining—the general arrangement or plan for its most economical development—is derived from the first, and is proceeded with more on the basis of facts of observation than on any abstractions or facts of science, the "empiric art" enabling the experienced miner to determine what science is in all cases powerless to effect—the proper place to commence working shaft and other subordinate and contributary operations.

The third and last division of practical mining is its detail, and in this the first division is essentially involved, whilst the second, according to the facilities afforded by its general arrangements, exercises an influence inevitably through all its ramifications. This division also comprises the sciences mentioned above, and subsequently becomes the most important—at least, so in appearance, inasmuch as the general arrangement or plan, being fixtures, are receded from, and, consequently, comparatively lost sight of.

I am aware that it is almost, if not altogether, a foregone conclusion that the practical man in mining is unreasonably opposed to what he considers the innovations of science, and that his opposition has no better foundation than prejudice; but this is only an assumption, and one of the most groundless.

No class of men welcome improvements, "worthy of being so designated," with greater heartiness and cordiality than do the mine agents of Cornwall, but they are jealous, and justly so, of the plausibilities of mere pretenders, especially when the outline and delineations of their alleged improvements, besides being characterised by every conceivable incongruity, are irreconcilable with the instincts of that most rare of all designated common things—"common sense." It is to be regretted that men like "Critic," whose pretensions to literary attainments are unqualified, should avow themselves in danger of being influenced more by "sound" than by "sense"—that is to say, by the manner more than by the matter of a person's writing.

If scholastic education conduces to such a result, I have no hesitation in saying that a knowledge of things is far preferable to a knowledge of letters, inasmuch as the tendency of the latter is rather to contract than to expand the mind, unless it be admitted that the class of which "Critic" may be regarded as a representative is decidedly exceptional.

I shall waste no time in the vindication of my style or manner of writing, but content myself with saying if I were disposed to carp at style I would not only point out, but prove, graver and grosser defects in "Critic's" style than those he has enumerated as disfiguring my own. "Critic" would do a greater service to mining by pointing out its defects, and how they may be remedied, than by carping at my peculiar style of writing, or that of any other individual. I shall conclude by asking him to name the departments of mining which may be improved by an extended application of the sciences. I am quite sure that this will tax his energies, and subject him to greater embarrassments than the stringing together a limited or any number of prosaic platitudes. ROBERT KNAPP.

Ellsworth, Nye county, Nevada, Aug. 2.

AMERICAN MINING, AND ENGLISH CAPITAL.

SIR,—The above heading involves a connection which cannot fail, if properly reciprocated, of becoming highly beneficial to both countries, as well as to all parties interested in mining. Capital unemployed is of no more use than mines undeveloped, and if no new fields of enterprise were projected those at present existing would, of necessity, become too limited for the employment of the ever increasing capital arising from successful commercial pursuits.

If the state and condition of American mines were properly represented to the British investing public no necessity could arise for the oft repeated interrogation—If your mines are as good as you represent them to be what can you want with outside capital? After a residence verging on six years in the State of Nevada, aided by all I have read in English and American papers regarding its metalliferous resources, I am fully convinced they have not been exaggerated; although I am free to admit that in many instances they have been misrepresented, and in a majority of instances to the prejudice of mining in the States. And it is my opinion that this has resulted more from ignorance of the nature of mining than from fradulent design in the sale of the stocks. I have no idea here of being understood as intending to convey the impression that such is the result of moral motives. I mean no such thing, but merely that the original owner of mine shares, from a want of better experience, thinks his mines all that he claims them to be. Still the enthusiasm of comparative, if not of utter, inexperience should be allowed to weigh nothing in opposition to the stern, sterling, and ponderable facts of history and experience. One would be almost led to conclude from the expressions, as well as the actions, of some men that they regarded two or more independent codes of laws as operative in the mineral kingdom, producing effects diametrically opposed to each other, else why is the occurrence of shallow metalliferous deposits in foreign countries exempt from distrust, so inseparably connected therewith, as to their continuance in depth, which at all times attaches to similar deposits at home? There is a condition of things, I am well aware, associated with which the shallow deposits form a continuous connection with the permanently productive lodes in depth; but that is a condition, or result, contingent on other conditions, or natural laws, without which such occurrences could never conceivably take place.

The history of mining in West Cornwall stretches so far back into the dim past that the peculiarities of the shallow deposits of the most productive lodes there have long since been wholly obliterated, and can only now be inferred from what has transpired, and is now transpiring, within the memory of living men.

East Cornwall has furnished within this period several notable examples of legitimate metalliferous outcrops, which are connected continuously with the permanent deposits in depth; prominent amongst which may be mentioned South Caradon, Wheal Mary Ann, Wheal Trelawny, Wheal Wrey, &c. These were exceptional instances of successful Cornish mining, without being necessitated to accomplish much preliminary dead work, and being subjected to its inevitable outlay; and, at the same time, the correct exponents of a law obtaining in the mineral kingdom, and regulating such occurrences.

To anyone at all acquainted with the topography of these mines it must occur that the nearest approximation of the ores at either of them to the surface was in the contiguous valleys, which in all cases are situate transeversely to the lodes, the dip of the ores in which was into the adjacent hills, at the foot of which the outcrop occurred; so that instead of being the effect of mere eruptive forces in the upheaval of rocks, such deposits are the result of an entirely independent combination of forces, both mechanical and chemical, equally unobtrusive in their general action as they are efficient in their effects.

Whenever my mind reverts to the mining geology of Cornwall the idea of perfection invariably associates itself with the view. I do not think the regularity which prevails in the rocks there can be excelled by any part of the world, and certainly their prolific character is without parallel. If this conclusion be correct, as I am quite sure it is impartial, the Cornish miner who has had anything like a varied experience in his own country must carry about with him wherever he goes a model and standard of reference, which will never fail him, if its analogies are applied with anything like sound common sense and judgment to the mining geology and metalliferous resources of almost all other countries. Marked differences, however, will appear in passing from one country to another, but they are, it should be remembered, differences less of kind than of degree, and do not in any case exceed the resources of the practically educated mind to comprehend.

The maxim that order is Heaven's first law may be read upon the rocks of Cornwall, therefore the prolific character of which can never be disassociated from tranquility. The question will hence arise, is tranquility the inseparable accompaniment of metalliferous deposits? And here it must be replied that an unqualified yes or no would be no truthful answer to the question, as it is well known that large bodies of metalliferous minerals are found occupying positions so elevated and remote from the known agencies which alone effect their formation, and so associated with disorder and confusion, that some force or forces subsequent to their formation, it must be concluded, had acted in producing their upheaval. It is also clear that metalliferous deposition to the extent found to prevail in our mines generally could never have taken place without the prevalence of order and tranquility. The position, then, must be accepted that large bodies of metallic minerals are found in other localities than those in which their deposition took place. And as it sometimes happens in mountainous districts that both the rocks and lodes have been subject to more than one disruptive movement, besides being subject to other deteriorating influences, it is clear that these conditions should be regarded under a highly qualified aspect; and in this light they become fundamental questions and facts which should

underlie and control the estimated value of comparatively undeveloped properties.

The presence of eruptive and disruptive rocks in mountainous disiricts, and where the contour of some of the greater as well as of the lesser elevations proclaim their volcanic origin, but rent by subsequent disruptive forces, it requires no stretch of the imagination to conceive that a somewhat different order of things must prevail associated with such conditions than that found to prevail in comparatively level countries.

There are at least two kinds of metalliferous deposits of the productive class by which mining enterprises are largely affected, and especial care should be taken to distinguish between the one and the other, as much injury has arisen, and will still arise, from their confusion. In the interests of mining a clear and unmistakeable line of demarcation should be drawn between them, so that the sensational should never be confounded with the solid and substantially permanent productive class of mining investments. And in this lies the motive which prompts my efforts in this communication, as both these classes of mines are largely represented in this part of the country. To say that a number of worthless schemes are afloat would be merely saying that the same thing exists here which is found to prevail in all other countries, as success in any enterprise, or undertaking, becomes almost invariably the prelude to imitation, if not of downright imposture.

What I would say to the English capitalist is this—there is a field for mining enterprise and investment on what is termed the Pacific Slope of the United States unequalled both in quality and extent by anything known in any other part of the world; and all that is necessary is the exercise of a judicious mining knowledge in the selection of its individual enterprises. If an agent who is selected for the inspection of mines—especially foreign mines—does not possess a mind sufficiently capacious and enlightened, either theoretically or by practical experience, to comprehend the physiology of a mining section, or district, after having duly examined it, he lacks the first indispensable qualification for the office he has undertaken, and if disaster follow from such official ignorance who can be justly blamed besides the instrumentality, innocent though it may have been of every such intention.

I have frequently thought how much the English capitalist might be benefitted by adopting a simple preliminary precautionary measure, as easy and comparatively inexpensive as it is simple. The maxim, If a person does not take care of his business his business will not take care of him, has nowhere a more direct and unqualified application than in mining.

What I would suggest is that a few of the representatives of English capital should meet in London, a sufficient number to represent and form the nucleus of (say) half-a-dozen companies, and then proceed to appoint and equip an expedition for the purpose of making a tour of inspection of the Pacific portion of the United States. Four individuals would probably be sufficient—a geologist, an assayer, and two competent and variedly experienced mining captains: each of these officers should separately report, except the captains, whose reports should be conjointly, to the appointed officer in London on the merits or otherwise of the several mines and districts examined by them. Such reports to be accompanied by recommendations and special advices, together with some, at least, of the reasons and consideratsons on which such advices were founded, for the instruction and guidance of the appointed executive in England. I need not suggest the details of such an organisation, these will best suggest themselves at and subsequent to its inauguration. I have not the least doubt but that the expenses of such an expedition would be proportionately small compared with the advantages that would result to mining generally, and to its promoters in particular. Dollars by the hundred would command better purchases if tendered to the owners of mines on the spot, than thousands would do through the usual channels in London. The reason of this is obvious. Middlemen will be excluded, and both doubt and delay as to effecting a sale by the original vendors annihilated, and their antithesis, prompt certainty, substituted.

An expedition of this kind should, on arrival at some point of commencement of their special duties, purchase a suitable wagon, and a pair or more of horses, probably four, and provide their own outfit for independent travel, and decidedly camp life—which, of course, means provisions, cooking utensils, and sleeping accomodation. Blankets (Californian being preferable) are all that is necessary. Sleeping in the open air in these dewless latitudes in the summer season is more of a luxury than an inconvenience. Possibly a fifth officer might be advantageously added to the expedition, to take charge of the commissariat, disburse expenses, and keep accounts.

I am fully convinced that nothing could contribute more to the success of American mining, and the profitable employment, and consequent increase, of English capital, than the inauguration and prosecution of some such scheme as I have here set forth. There are a great many valuable properties here requiring a preliminary outlay to their success, and which pen and ink sketches, without drawing largely on the imagination, can do very partial justice to. Their wealth is at present indicated, and not demonstrated, a phrase by which most of the permanently productive mines of Cornwall we hear characterised, and consequently cannot but be approved after such a model.

ROBERT KNAPP.

Ellsworth, Nye County, Nevada, July 19.

SILVER MINING ON LAKE SUPERIOR.

SIR,—Your readers will, no doubt, be glad to know something of the wonderful little "Silver Islet" which has caused so much excitement upon this side of the Atlantic, and brought so much profit to its fortunate owners. A month's residence on the spot, with every opportunity most courteously afforded me by Capt. Frue for examining the mine and its neighbourhood, has enabled me to give you a description of it, but I fear I may be accused of exaggeration, although I intend to confine myself to mere facts.

Until the rich discoveries of minerals were made on the south shore of Lake Superior the Canadians considered that on their side they had only immense tracts of waste lands, but the formation being alike on both sides explorations were made, resulting in the discovery of some rich veins of copper and iron. In 1846 a company, called the Montreal Mining Company, was formed for the purpose of securing lands in the mineral district, and after a thorough examination they located at different points, altogether about 107,000 acres, but after expending large sums in exploring and working, without any satisfactory result, the company became discouraged, and for some years discontinued almost entirely their operations.

Reports reached them from various sources of rich silver ore being found on a small islet near Thunder Cape, but lack of energy and funds, and the difficulty of commencing mining on such a small and exposed spot being so great, little or no action was taken. Last year, however, Capt. Frue, who has long been engaged in mining on the south shore, paid the islet a visit, and being satisfied of the value or the lode found thereon, formed with some difficulty a company in New York, and in September last they purchased the whole of the Montreal Mining Company's lands for $225,000. In the beginning of that month Capt. Frue landed on the mainland opposite the islet with a small party of workmen, and, in the face of difficulties that would have appalled a less bold man, commenced his operations. The islet is only a small rock, about 70 ft. in circumference, and on the highest point only 7 ft. above the level of the lake. It lies about one mile from the mainland, and is exposed to 300 miles of open water on the south-east side. The whole district was an uninhabited wilderness of rock and forest, and presented a most inhospitable appearance to those about to spend a long winter on its shores, but with great rapidity trees were felled and houses built on the mainland and coffer-dams and crib work erected on the islet, and mining commenced. Three weeks' working raised the spirits of all concerned, the vein proving richer than was expected by the most sanguine. With a force of ten miners there was taken out in that time and shipped to the smelting works at Newark ore to the value of over $100,000.

Now, however, Capt. Frue received his first experience of the violence of a Lake Superior storm. Nearly half the crib-work and coffer-dam was carried away, and the mine filled with water, and not till late in November were the necessary repairs made and mining resumed. During the winter months the work was carried on without much interruption, but on the breaking up of the ice, which occurred about March 1, a succession of heavy storms and immense fields of floating ice carried away about 450 ft. of breakwater, and at one point completely destroyed the coffer-dam. Not discouraged, however, men were set to work to make good the damage, which was completed in a very substantial manner by May 15. Since then the work of strengthening the breakwater has been carried on with vigour. It is an enormous structure of wood and stone, having a base of over 65 ft., and thoroughly bolted together, and when finished will have an elevation of 10 ft. above the water level, and be capable of resisting all attacks of sea or ice. Notwithstanding the winter's delays and hindrances, there was shipped on the opening of navigation, in April, $300,000 worth of ore, and the following figures will show the enormous results obtained up to the present day:—

Amount of purchase-money for 107,000 acres.....	$225,000	
Spent on building, clearing, mining, &c.	120,000	
Estimated amount required to complete the works..	30,000=	$375,000
Amount obtained for ore shipped		700,000

This statement, however, hardly conveys a true idea of the full value of the mine. One must also know that at no time where there more than fifteen miners employed; that the average number was about twelve, and that only 135 fms., or 2400 tons, of rock have been moved. Of this rock only 400 tons have been sent to market, and the remaining 2000 tons are piled up, and have been assayed, and valued at $40 to $50 per ton.

The shaft is now about 50 feet deep, and averages about 9 feet wide, but although in some parts the width is 12 feet the footwall of the vein has not been reached. Great care has to be taken to keep a good wall between the mine and the lake, but after sinking 10 or 20 feet further cross-cuts can be made to find the full thickness of this wonderful lode.

The silver is found in the shape of native silver, silver glance, and silver-lead, and the writer has seen lumps of ore weighing over 500 lbs., containing over 50 per cent. of the pure metal. So far the average value of the rock removed has been about $330 per ton; but before sending it to market large quantities are dressed with ease up to $6000 or $7000 per ton. The mine continues to the very bottom as rich as ever, and there seems to be every prospect of its continuance. So much for the islet. On the mainland work has been carried on with equal vigour. Clearings have been made, gardens planted, and houses built to accommodate 300 workmen, and two of a better class, in one of which Captain Frue resides, and in the other Major A. H. Sibley, the hard-worked president of the company, and his family have taken up their summer quarters, and extend unbounded hospitality to the numerous visitors who come to see "the richest silver mine in the world."

Were this islet the only possession of these American speculators they would be considered fortunate indeed, but they are realising that "unto whom that hath shall be given even more abundantly." Not only is there every prospect of their striking the Silver Islet vein on the main land, but during this last week they have opened a mine on Jarvis Island, about 30 miles west from here, and on one of their numerous locations. This vein runs through the same rock, and in the same course, as that of Silver Islet; and, although it has only been sunk on for a few feet, they have already obtained some samples of ore rivalling Silver Islet in richness, and of precisely the same character. Great hopes are also entertained of good results from the explorations on the company's location in Neepigon Bay, which are being carried on under the able direction of Mr. Henry F. Q. D'Aligny. The richness of Silver Islet has attracted great numbers of explorers, mostly from the American side, and immense tracts of waste lands have been purchased, no doubt greatly to the satisfaction of the Canadian Minister of Finance.

Silver has been found in large quantities on the north shore of Thunder Bay, amongst the fortunate owners of mines there being Mr. Beck and partners, Mr. Simon Mandelbaum, and the Algoma Silver Mining Company (Limited) of London. There seems to be every prospect of this wilderness being turned into a vast and rich mining district. I am bringing home with me a large number of specimens from the various mines, and will be happy to show them to any of your readers who will call at my office in London.

Silver Islet, Lake Superior, July 31. R. F. M'EWEN.

MINING IN WHITE PINE, NEVADA.

SIR,—The very able report by Mr. J. D. Hague, just published by the directors of the South Aurora Company, should serve as a warning to those mad investors who have forced the shares of the companies operating there to the preposterous prices lately attained.

Writing you on this subject a year ago, I said—"Time alone will show how far I am wrong, and it is simply a waste of time to answer every mere assertion and statement put forward to contradict absolute facts, however unpalatable those facts may be."

I have been and am still quietly waiting, knowing that results will prove the correctness of what I then stated. Facts are already beginning to tell, but the worst is not yet. P.

London, Aug. 25.

MINING BUREAU OF THE PACIFIC COAST.

SIR,—As you were good enough to publish in the Supplement to last week's Journal my letter respecting the Utah Silver Mine, may I ask for a small space in your valuable columns for the following remarks. The directors of the different mines coming out in America have not now the slightest excuse for taking up worthless speculations, as I find from the Supplement to the *Mining Journal* of Aug. 6, that a Mining Bureau has been formed in California, for the purpose of inspecting and issuing fair reports on any mines if applied to; I would, therefore, draw the attention of the directors and shareholders of the Ajax (Big Indian) Mine, the Snowdrift, &c., before they decide on taking these mines, to have them inspected by a mining engineer connected with the Mining Bureau. I find that in the Ajax (Big Indian) Silver Mine the whole of the directors only hold between them 251 shares out of the 8000 that the company is composed of, therefore it is needful that the rest of the shareholders, for their own interest, should have this mine well tested before they decide to purchase, and, of course, a meeting of the shareholders should be called, and their opinion taken, before the purchase is concluded.—*London, Aug.* 23. MINING BROKER.

"THE SCIENCE OF INVESTMENTS."

SIR,—The Dolcoath tin mine is assuredly a most valuable, instructive, and interesting mineral property. There is no mine extant in the West Cape of England that has contributed so largely to the gains of shareholders, and afforded so large a field of employment to miners in the district, and artizans throughout the manufacturing counties, as this old mine of a century's growth. It was for many years the richest copper-producing property in Cornwall. It has also from time to time yielded large and rich quantities of capillary, muriate, and silver-lead ores, and at present is one of the richest tin mines in the world. The 302 fm. or 604 yard level is worth 80*l.* per yard for tin—*i.e.*, every 3 ft. of the forebreast. The height of the level and the width of the lode is worth 2*l.* 4s. 5d. per inch in driving eastward The yield for May and June was 16,493*l.* 17s. 5d., and the gains 5541*l.* 8s. 11d., to which must be added 595*l.* 16s., balance of purchase of Stray Park, but without this latter sum being included the gains are fully 33,000*l.* annually, and 40,000*l.* with it; this, too, with augmented reserves, monthly increasing resources, and advancing prices of product. The shares are 1432 in number, and are to be had at about 175*l.*—say, 250,000*l.* for the entirety; the last two-monthly dividend was 3*l.* 10s. per share, but the profits are equal to 13*l.* 4s. per cent. on the market value of shares. This mine is peculiar in its character, eventful in its history, instructive in its ever-changing and varied phenomena, affording more varieties of strata, rock crystalisation, and geological features than probably any other mine in Cornwall. Its greatest depth from surface is about 680 yards, and it has returned more minerals than any other known copper and tin mine in the West.

The late respected manager, and father of the present manager, was practically associated with the undertaking for upwards of 70 years; he raised himself through application, earnest endeavour to learn, untiring energy, steadfast integrity, and consistent abnegation from all excesses from a barrow-boy underground to a workman on tut-work and tribute into a master dresser at surface; and after filling the various duties of a sumpman, timberman, pitman, and foreman, he became captain, and thence on to be manager for many years of this and others of the most flourishing mines in Cornwall.

All hail to the enterprising spirits of the age, who foster success through undeviating and earnest self-application to the study of Nature's laws and natural phenomena. The late Captain Charles Thomas observed that it was far easier to decide where minerals would not be found in paying quantities than to determine with unerring accuracy where they could be discovered in remunerative bulk; still with the aid of the sciences, and the advancement of skill and the arts, there were no more dangers associated with mining than with the other speculative enterprises of the Mother Country. Charles Thomas was as great a man in his mining career and successes as Stephenson was in the locomotive engine in railway success. Trevethic was the inventor of the locomotive, and was a greater engineer than Stephenson; the former had every difficulty to contend against—want of money, superstitution, and conflicting existing interests, no patronage, and far-spread distrust; whilst Stephenson had unlimited means, universal support and patronage, and the requirements of the time to prop him up step by step, with the varied interests of thousands to propel him along, as if driven by a screw-driver. Again, Sir Humphry Davy, born at Penzance, did great good for his native and mining county, and also for the sciences and his country, and will ever rank amongst the most useful and practical of our modern philosophers. Putting "*this*" and "*that*" together, Sir, is not at all times agreeable, nor is it all times conducive to the best of feelings between contending parties and interests, still the science of investments to be of any practical use must be earnest and searching.

It is no use to "cauterize" unless there be "disease," nor is it any use to generate "scum and impurities in brine" unless you purify the liquor to preserve the meat. So in mining, there are two sides. Dolcoath is a bright instance of legitimate Cornish mining, yet there are many others, which for example we denominate "sensational mines," as for instance South Condurrow and Wheal Grenville, two ever changing, fluctuating mines, whose varying prosperity have occasionally resulted in even more bitter disappointment than arises from mines that never make returns.

South Condurrow has risen to 9, 9¼, per 6123rd share, upon payment of a quarterly dividend of 2s. 6d. per share. It is not so much that we complain of the property selling at 18 to 19 years' purchase, even if the dividends were earned and secured for the future, as that the expenditure was only charged up to the end of June, whilst the local manager came to town "post haste" the day before the meeting with a tin bill dated the middle of August, which changed the "statement" prepared for submission to the shareholders on the following day from a losing to a profitable "account." There is many a slip betwixt the "cup and the lip," and lucky for those who sold their shares at the rapid advance on the 2s. 6d. dividend that there was no mishap on the railway. What will be the statement of accounts at the end of September if all costs and merchants' bills be charged up and no produce credited sold after the 30th of next month, is a question of first importance to all intending investors.

Wheal Grenville has been at work to my knowledge for about 40 years, and done no good. Millet Thomas and his party were swamped in losses and hopes. The Messrs. Taylor expended liberally, and gave up, upon scientific and practical development of various points, in despair of success. Joseph Lyle, one of the most enterprising and plucky miners of the present century, took the concern in hand, spent his money, was satisfied, and cut it. Next comes the existing company, who have expended about 150,000*l.*, with the single cheering return of a 5s. dividend (possibly two): it is so long ago that distance lends enchantment to the view.

The company appears to be divided into 5720 shares, marketable at 7 to 7½, and from the published report it seems that unless dividends are imminent a long period of deferred and periodical calling is in perspective. The only pioneer point valued is the 100 east, 15*l.* per fathom. The exhaustive operations are as follows:—The winze below the 100, 10 ft. long, 110*l.* to 120*l.* per fathom; 3 fms. stoping in back of this level is valued at 140*l.* to 150*l.* per fathom, (say) 46*l.* 13s. 4d. to 50*l.* per cubic fathom. The winze below the 80 east is valued at 40*l.* per fathom. The 110 east is of no value, and should the 100 fm. level be driven 3 fms. monthly, and it holds good 5 fms. up and 5 fms. down, 450*l.* of tin monthly is being discovered, which probably can be wrought at a cost of 12s. 6d. to 13s. 4d. in *l.* over a period of 12 to 18 months.

Wheal Lucy appears to be a certain prize; the shares are few in number, and the large majority well held. Those floating about the market will soon become absorbed.

West Jewell is drained 3 fms. below the 30, yet the back is set on tribute to four sets of workmen, even before the level is cleared out of rubbish, or the agents able to set a value on the lode. (See report.)

Crown-court, Threadneedle-street. R. TREDINNICK,
Consulting Mining Engineer.

EAST CORNWALL ST. VINCENT MINE.

SIR,—Certain persons seem not to be capable of crediting the statements made as to the East Cornwall St. Vincent Mine, and have, by way of confidential communication, written to parties connected with the company. Now, in order to put this matter to the proof, I will pay 100*l.* to the first person who shall prove that I have made any false statement in regard to these mines, or exaggerated any fact. Contrary to this, much has been withheld that might have been said in their favour. I take the same position with regard to the reports accompanying the prospectus, and challenge anyone to produce a single fact to their discredit; and, in confirmation of all that has been said, we yesterday opened on a branch of silver 6 inches wide, producing 784 ozs. of silver to the ton, and getting larger going west. About 100 fathoms west of this we are driving on a parallel branch, worth 40*l.* per fathom, at a cost not exceeding 50s. per fathom. Every care is taken to ensure the greatest accuracy in taking the samples and obtaining the assays, and it will give me great pleasure to afford facility to anyone disposed to test this. In addition, I may add that I am ready to give 5*l.* for every report of mine on any mine during the last 20 years that has not been found to be literally correct, where the operations have been conducted accordingly. I have never at any time received a penny in the shape of promotion money, and have never introduced a property that during its history, on its merits, would not realise five times its cost; but I have given my owners 20,000*l.* per annum profit, and the chances are that I shall do it again.

Harrowbarrow, Aug. 22. C. PENGILLY.

MINING MYSTERIES.

SIR,—I should be sorry if I had inserted any incorrect statement respecting a certain dividend mine in my letter appearing in the Supplement to the Journal of Aug. 19. I therein stated that a sale of tin of 11 tons 8 cwts. 1 qr. 25 lbs., at 76*l.* 17s. 6d. per ton, amounting to 878*l.* 4s., never made its appearance in the *Mining Journal*, as all the other sales of tin have done.

Now, you have added a note to my letter to the effect that this sale was duly inserted in the Journal of June 17. On referring to that number I find that the sale of 11 tons 14 cwts. 1 qr. 16 lbs., at 75*l.* per ton, amounting to 878*l.* 19s. 6d., on June 7, does there appear; but that the other above-named sale of tin does not appear in that number of the Journal, nor in any other, as you can easily satisfy yourself by reference, though it appears in the balance-sheet as sold June 14.

In justice to myself, I must request you to insert this explanation, or otherwise I must appear to have made an unfounded statement, prejudicial to the management of the mine.—*Aug.* 19. OZOKERIT.

MINING IN CARDIGANSHIRE.

SIR,—I have this last week past visited the mines in the neighbourhood of Talybont. The first we come to from Aberystwith, seven miles distant, is the CWM LERY—a property consisting of many lodes both east and west, also north and south, and all of them expected to fall together at about the centre of the large sett, computed to be upwards of a mile long by more than half a mile wide. The local position is good, being surrounded by some of the best mines in the county. To the north lies the celebrated Allt-y-Crib, North Allt-y-Crib, Tallesin Mines, &c. To the east lies the Cardigan Bay Consols, Loveden United, Penpompren, &c.; and to the south is the Mynidd-y-Gorddi Mine, now just beginning, with a lode of such magnitude and riches that the Van Mine would blush to be brought near it for splendour, or any other lode in the Principality; this lode runs parallel with the Cwm Lery Mine, the Court Grange, Bronfloyd, Darren, Goginan—in fact, the Cwm Lery is surrounded with the best mines in the county. Their underground operations are confined to the driving of an adit level south of the vale into the hill, from whence some tons of beautiful mineral have been broken, and are to be seen on the surface at the mouth of the level. They expect by driving 2 or 3 fms. further to intersect the great lode just under the turnpike road, leading from the village of Talybont to the shipping port of Aberystwith, also to the railway station, two miles off, when they will immediately run down a shaft from surface, send out cross-cuts, drive their levels east and west, also send the shaft down to another 10 fm. level, when, in

my opinion (after 30 years mining experience in this county), they may safely expect good and lasting returns. The River Lery (pronounced Leary) runs by the foot of the sett, just under the adit level mouth, with an ever rolling stream to work any machinery ever required.

Having to go on to the Llanidloes mining district on the same and following days throughout the week, I could not spare time to go over the West Allt-y-Crib, adjoining and belonging to the same mining party as Cwm Lery, but hope on some future day to have that pleasure, as I wish them every success in their speculations. SAMPSON TREVETHAN, M.I.C.E.

Rheidol Cottage, near Aberystwith, Aug. 24.

SOUTH CONDURROW MINE.

SIR,—I was glad to see by last week's Journal that "the 32 additional stamps are working well, and have ample supplies of tinstone of good average quality to keep them going, from which our future sales of tin will be considerably augmented." Under these circumstances I have to congratulate the shareholders upon the improvement in the mine, which is now telling its own tale, independent of so much having been said against it. IRISH SHAREHOLDER.

Lisdourt, Aug. 22.

CEFN CONSOLS MINING COMPANY.

SIR,—It was pleasing to see the letter in the Supplement to last week's Journal from "A Shareholder" in this mine, as it is quite time shareholders, as a body, ought to bestir themselves. The mine I believe to be capable of being brought into a profitable state if properly managed; and, as on this the whole thing depends, information on the matter ought not to be kept back from shareholders. It has the appearance of something very unbusiness-like, to say the least of it; therefore shareholders will do well to look to their own interests, and at once organise a committee of investigation, and not to allow their property to lie dormant at a time when so many are up and doing, with splendid expectations afloat, and this property might be one of the number. It cannot be right for those in power to content themselves after expending nearly 30,000*l.* over raising and selling a paltry 10 tons of ore, worth about 110*l.*, and to offer nothing further to the shareholders either in the shape of sales or prospective dividends.

I am informed the directors are looking forward for great results from the 25 fm. level, on the north and south lode, acting upon the advice of Capt. Ellis, of the Talargoch Mine, in sinking down upon this expected valuable lode; but when will this be reached, and the profitable results obtained? I fear that unless shareholders take the matter in hand the north and south lode will be nothing but talk for the directors; therefore I advise the shareholders to be up and doing, as by instituting a more practical business-like state of things they may bring their property into a paying state without at least so much needless delay.—*Aug. 21.* A SHAREHOLDER.

CEFN CONSOLS MINING COMPANY.

SIR,—I have read with great interest a letter in the Supplement to last week's Journal, signed "A Shareholder," regarding the above mine, and quite agree with him that a committee of investigation should be at once appointed by the shareholders to consider the condition and prospects of the mine, which I am afraid are very precarious. I attended the last half-yearly meeting, when our Chairman assured us that the mine was making great progress, but time was required to develope its resources. Not a word has been heard or said of the mine since, and the unlucky shareholders are totally in the dark as to whether the mine has finally collapsed or otherwise. It strikes me that a new board of more competent directors should be formed, as it seems to me that, with the exception of Dr. Collis Browne, there is no one of much mining experience on the board. In our present difficulties (for I am sure they are great) men of practical knowledge are required at the head of affairs, and not men who at the last meeting seemed to me quite out of their element, and totally unfit to represent the shareholders of a mine. AN ORIGINAL SHAREHOLDER.

Gray's Inn, Aug. 22.

PRINCE OF WALES MINING COMPANY.

SIR,—There is one thing I think requires a little explanation from the managing authorities of the Prince of Wales Mine, and it is this—In the weekly reports from the mine we never see any mention made of the further sinking of the shaft. All we read is that they are driving the levels and stoping them, &c.

Now, Sir, in my poor opinion as an unprofessional shareholder, it is essential to the success of a mine to continue sinking, more especially as the Prince of Wales appears to be in the transition state from copper to tin. I do not know what the directors think on the matter, but I certainly do not think it advisable to depend alone upon the levels already opened, as their value may at any time drop off altogether. At the last meeting but one the directors stated they believed they would have a valuable mine in depth, and yet we see no evidence that they are about to prove their assertion. Why not? Perhaps they will humbly explain their reason for not trying to prove whether Capt. Pryor is right or wrong in saying that there is abundance of tin in the Prince of Wales Mine to be taken away, if they will go deep enough for it.

I hope the directors will not allow this to drop, as my opinion is, according as I have watched the progress of the mine, that Prince of Wales bids fair, with energetic development, to become a good tin-producing mine, as other copper mines have become; and I think, with the shaft sunk deeper, and levels opened out below in tin ground, we ought before very long to resume dividends from the tin alone. But, as I said before, I cannot see how we are to do that if we are not to go deeper to find the tin. Perhaps the managing authorities can enlighten on that point. A SHAREHOLDER.

YUDANAMUTANA COPPER MINING COMPANY.

SIR,—In consequence of a telegram received in this country some time since, I bought 20 shares in this company, for which I paid 120*l.*—or cent. per cent. premium. Soon after my purchase I found that not only had the entire capital of the company been expended, but that the manager in Australia had overdrawn the company's account to the tune of 8000*l.* or 9000*l.*; but simultaneously with these facts came another wonderful telegram, dated Galle, Sept. 6, 1870, informing the shareholders that "the sulphuret lode, now 16 ft. wide east and west, all solid ore, of 30 per cent., still widening, length as yet undiscovered north and south; have cut hot water; splendid prospects for the company—hope fresh capital is raised, now indispensable." Well, Sir, in consequence of this information I increased my interest in the company by subscribing for a few debentures proposed to be issued.

This day (Aug. 14) I have received from the secretary information that the bonds have not been taken up as the directors expected they would. The shareholders, at least I for one, have not the slightest confidence in the adventure; and would rather lose the whole I have staked than entrust one penny more into the hands of the directors, therefore the sooner the whole matter comes to an end the better.—*Aug. 17.* VICTIM.

GENERAL BRAZILIAN MINING COMPANY.

SIR,—In the first report of this company appears the letter and report of Capt. T. Treloar to the Chairman, dwelling upon the mine being promoted for the benefit of capitalists and poor miners out of employ. He considers naval captains—say, gentlemen of education and position—incapable of superintending mine property. Has his practical experience at Morro Velho this theory? as likewise that a single property cannot be depended upon? or do other obligations force him as a Paterfamilias?

The second report publishes that to December, 1870, 139,060*l.* 2s. 7d. was expended, and 90,447*l.* 0s. 3d. has been paid by purchase acquired. This may be as certain as Maquine was forced upon him through a rock formation, and correct, no doubt, to the threepence; but, unfortunately, tales spread themselves from Itabira, through the late proprietors, that they only had some Rs. 220,000 @ 60, at the exchange of 18, which realised about 18,000*l.* At all events, to inspect the property at this time no one can see value to anything like the amount of 150,000*l.* Be it as it may, I sympathise with the man who publicly professes so much for society and *bona fide* mining (as noted by Capt. Treloar in his two lectures), but who errs in his translation of St. Hilaire, which he recommends to those interested, I presume, for the purpose of aiding additional capital—the original being called up or expended.

I myself doubt much but that single investments, honestly selected and properly managed, would give better results—personally, union is strength, &c., but I do not see that these remarks apply to mines. A SUBSCRIBER.

[For remainder of Original Correspondence see to-day's Journal.]

FORMATION OF GOLD NUGGETS.—Mr. C Wilkinson, of Australia, announces, to the Royal Society of Victoria, some experiments instituted by him, which Mr. Daintree assumes will account for the formation of gold nuggets. Mr. W. Skey has also communicated to the Wellington Philosophical Society of New Zealand a number of experiments upon the same subject. Having no desire to detract in any way from the merits of the labour of those gentlemen, it must be remembered that others have contributed much knowledge on the same subject. The discovery of laws which regulate chemical energy is the result of pure experimental enquiry, and is often the result of the combined labours of many illustrious men. For the benefit of those who are likely to pursue that subject, it will be necessary to call the attention to some facts that have come under my own observation. It will be seen that Mr. Wilkinson conducts his experiments by using a solution of gold undergoing decomposition by contact with organic matter. Gold is deposited upon itself. He also observes that some of the other metals and their sulphides act as a nucleus for gold thus reduced. Mr. W. Skey, pursuing the same subject, is surprised to find that the same effect takes place without the intervention of organic matter, the proto-salts and the sulphides effecting a direct reduction. The question here arises, what new ideas have been advanced by the experiments above reported? Depositing gold upon itself, as on other metals, is certainly no new feature. Chemistry has long been aware of such actions, their electro-negative qualities, and their behaviour among themselves. Mr. Skey is surprised to find gold deposited upon cubes of galena, and many of the sulphides. If Mr. Skey had pushed the matter a little further he would have found that it was not necessary that it should be a metal, or its combination with sulphur, to form a nucleus to determine a deposit of gold. He would have found that graphite and many other substances act in the same manner. Again, he ought not to have been surprised to find gold depositing from its solution, in presence of a powerful deoxidiser. Such chemical actions have been long known, and are daily verified in the chemical arts. Brown iron ore and quartz appear to be unsuitable material to recover a deposit of gold. It is evident that if gold had been deposited from its solutions, nature must have employed other means to effect its purpose than the one chosen by our experimentalists, since gold is found disseminated and deposited upon quartz and the brown iron ore. The question as to the formation of gold nuggets is a difficult one, and should be discussed with caution.—J. TURNBRIDGE: Newark, N.J.—*Scientific American.*

THE LOSS OF QUICKSILVER.—Mr. Almarin B. Paul, writing to the *Scientific Press* (San Francisco), in reference to the enquiry of a correspondent relating to the loss of quicksilver (whether it was to be estimated by the ton of ore worked or by the silver extracted), says—"As my experience goes, if the ore is carefully manipulated the loss will be per ounce of silver extracted, but close attention being so requisite, neglect often produces a loss, which should not be charged up to the "per ounce" of silver. My investigations of the loss in the Comstock mills show the average to be about 1⅜ lb. per ton of ore worked, while it has run as high as 1¾ lb. per ton, and, I may say, in some instances as low as 1 lb. In other portions of the State of Nevada, and wherever there is lead and copper in the ore, the loss has reached as high as 5 lbs. per ton, but this, of course, is exceptional. In the majority of instances, where lead, copper, zinc, or antimony is present in the ore, it is sure to equal 2 lbs. per ton. The statistics of loss for five years of the Frieberg works show it to be 1½ lb. per ton of ore worked. The Real del Monte shows 5½ ozs. of loss to every 8 ozs. of silver extracted. The loss of mercury depends on so many things—care in retorting must be included here—that everyone has got to work it out for himself. To work what is popularly termed "rebellious ores," and bring the percentage of loss of quicksilver within the loss of mills working free ores, like the Comstock, is a matter of impossibility. As to the loss in our gold mining that does not amount to much, as they do not use enough to catch the gold even alone—an evil which they will learn after awhile is "holding on to the spicket and letting out at the bung." In view of the enormous consumption—waste, we may say—of quicksilver, in connection with its high price, it is a subject not to be lost sight of; and I think "C. H. A." has done a good service in bringing the question up."

ON THE GOLD ORE OF NOVA SCOTIA.

BY DR. T. L. PHIPSON, F.C.S.

[Read at the recent meeting of the British Association, Edinburgh.]

The gold-bearing rocks of Nova Scotia extend along the Atlantic border of the province for a distance of more than 300 miles. They are 12,000 ft. in thickness, and are worked, in one district or another, through a vertical space of 6000 feet. These rocks consist of clay-slate and quartz, interstratified and upheaved, and are supposed to be of Lower Silurian age—lying in some places directly upon the gneiss, and at others on the Cambrian rocks, which cover the gneiss. The other minerals besides gold found in this formation in Nova Scotia are sesquioxide of manganese, iron pyrites, mispickel (abundant), zinc-blende, galena, copper pyrites (sometimes), calc-spar, native copper, cuprite, mica, sulphide of molybdenum, malachite, and oxide of iron. But at least one-third of the country is yet unexplored, though it has been 120 years under uninterrupted British rule.

In no place has the mining exceeded 300 ft. from surface, though it is asserted to be well known that the quartz increases in richness with the depth. The few mines worked from 1860 to 1867 produced together about 3 tons (English) of gold. Since then the yield has gone on steadily increasing.

I have lately examined a certain number of fine specimens of the above-mentioned rocks from the Pioneer Mine, in the Cariboo district, recently opened. Two of these specimens weighed respectively 12½ lbs. and 8¾ lbs. avoirdupois. They consist of a mixture of white quartz and dark-green schist (termed clay-slate in this country). A fair sample of these two stones was taken, and 15 grammes of it were treated with nitro-hydrochloric acid. The gold, precipitated as usual by sulphate of iron, weighed 9 centigrammes. Another analysis confirmed this result, yielding on 100·00 parts—

Gold	0·60	Silver	0·04

The gold stamped out of some rich specimens gave—

Gold	93·75	Silver	6·25

Which is similar to the richer kind of Californian gold.

The average yield of the mines now regularly working in Nova Scotia by the amalgamation process is about 1 oz. (troy) per ton, but much gold is wasted, as well as mercury, as the ore is often very sulphurous, and roasting has hitherto failed from being incompletely carried out without kilns. In some instances the yield has been five to ten times as large, and in many districts probably 3 or 4 ozs. of gold per ton of ore could be reckoned upon for a lengthened period. I am of opinion that a moderate amount of English capital and enterprise would soon make this colony one of the most successful gold regions on the globe.

I have examined the green schistose rock which accompanies the white quartz in the Cariboo district, above named, and which, like the quartz, contains gold. I have detected a notable amount of glucina in it, and traces of some of the rarer earths. It is a dark leek-green schist, with an unctuous feel, like talc; gives a nearly white powder, which loses 2·32 per cent. of water at a red heat, and then takes a reddish tinge. It is only fusible with difficulty, upon the thinnest edges, before the blow-pipe, and then whitens. The results of the only analysis I have made of it are as follows:—

Water	2·32
Silicic acid	41·20
Alumina	22·00
Glucina	0·33
Yttria, and earths insoluble in potash	Minute quantities.
Oxide of manganese	2·20
Protoxide of iron	15·47
Magnesia	1·44
Lime	1·79
Alkalies	7·65
Portion not attacked by the double carbonate of soda and potash, with some gold and silver	5·60=100·00

Whether this schistose rock should be termed clay-slate, talc-schist, mica-slate, nacrite, or talcite is a question I must leave to the geologist, the composition of all these rocks presenting much similarity. There is a small quantity of peroxide given, calculated here as protoxide. Gold is present in most of the minerals that are found in the quartz and green schist, especially in the arsenical pyrites and in the iron pyrites, some specimens of which are very rich.

I have little doubt that vanodic acid, titanic acid, and perhaps zirconia could be detected in all these schists, as well as the rarer earths above mentioned, but I have had only a limited period to devote to their analysis.

ORINOCO GOLD FIELDS.

A new source of vast riches has been lately discovered, and is slowly attracting the attention of the world, although comparatively unknown yet to the public in general, specially in Europe. As usual, it is the enterprising, the wide-awake Yankee who has appeared the first on the field, and has begun to gather the first crop and to reveal the treasures concealed until now in those comparatively wild countries. The first company established was American, under the title of the "Orinoco Exploring and Mining Company." According to the concession granted to them, they were obliged to pay a royalty to the State of 10 per cent. on the amount of gold extracted in accordance with their declaration to the treasurer of the State of Guayana, in Nenejuek, and we have been favoured with an official statement from that functionary, from which it appears that the same company, in 21 months from March 23, 1869, to Dec. 31, 1870, with only one machine of 25 stamps, have extracted and amalgamated ore to the amount of 22,290 ozs. of gold, worth 77,157*l.* 15s. 10d. This is the sum declared by the company for the purpose of the royalty they have to pay, and we have reason to believe that the whole of the expense of their establishment, machinery, &c., cannot be much above half that sum. This extraordinary success has called the attention of and encouraged others to follow on their track, and we have been favoured wich a letter from Dr. Plassard, Vice-Consul of France in Ciudad Bolivar, and the pioneer in those discoveries, who writes on June 18 as follows:—

"N. N., Esq.—Dear Sir: I have the pleasure of sending you a certificate showing the products of the American Company up to December 31, 1870. Since last January the company, having accepted the conditions imposed by the law of 1870, pay a fixed tax of $6000 (nearly 1000*l.*) per annum for concession of 400 mines, so that we do not know exactly the quantity of gold extracted since then. Information will surely be published by the aforesaid company, which you can get in the United States. As to the amount of gold exported by the miners, we have no true information upon which we could establish the basis of a certification. As to the number of machines or crushers introduced in the country, we can get no information in the Customs House, since there is no duty paid upon machinery, the entry of those articles is not booked. We have just now in the mines eight crushers, and one in the port waiting for transport. Of these, two belong to the American Company, or Folson's Company, one of them working 25 stamps (Neunpai), the other 30 stamps, not yet established. Another of 10 stamps belongs to the Callao Company, working with very good result since a few days. Another, 30-stamps, of the Anglo-German Company, has lately begun to crush, though not entirely ready. Then the 12-stamps machine of the Meunpie Company, nearly ready to work; then the Hanwa 10-stamps crusher, Chili Company, which must have begun crushing; the 12-stamps Sperry and Davis crusher, which will be ready in a few days; and last a 10-stamp crusher of a national company, not working yet. The prospect of our mining district is fair, and, as to Folson's Company, I can assure you that the products of the last month have been increasing.—I remain, yours (signed), PLASSARD."

By another reliable source (the President of the State, Senor Dalla Costa) it is affirmed that the first essays of the National Company, mentioned above have given the surprising result of obtaining 2 ozs. of pure gold every hour from the crushing of a battery of five stamps.

Upon these authentic data, we think it our duty to call the attention of English enterprise to that new field of riches, which appears to cover an immense area of auriferous and other mines. In fact, it is not all explored, and many are of opinion that it extends from the Yuruary, on the Orinoco, to the same system of mines in Brazil, in which are located Don Juan del Rey, and some others already known in this country. Will it not be time for English capital and enterprise to enter the field, and claim their share in those regions so favoured by nature?

"WESTWARD BY RAIL."

So many Englishmen are interested in the United States, in consequence of the large amount of British capital embarked for developing the enormous mineral wealth of California, Nevada, and the neighbouring States, that such a book as Mr. W. F. RAE'S "Westward by Rail"* can scarcely fail to be generally acceptable; it records the experience of one who has actually travelled the route which is now so well known to Englishmen by repute, and is written in a style that is at once pleasing and instructive. The new introductory chapter, which occupies about three dozen pages, adds much to the interest of the work, bringing the information down to the present time, and giving particulars concerning the mines which are at least worthy of careful consideration.

Readers of English newspapers, he says, might suppose that during the past year numerous rich stores of gold and silver had been discovered for the first time in Nevada and California. The truth is, the majority of the mines about which much has been written are of old date, and the greatest novelty relating to them is the fact that English capitalists have become willing to purchase them, with the avowed intention of developing their resources. Several years ago American sellers of valuable mining properties had considerable success in England. The Washoe Mines, the Imperial Silver Quarries, and other ventures, were transferred from American to English hands for a consideration, rendering the bargain one of which the American vendor had no reason to complain—it ultimately became necessary to wind-up these promising undertakings.

Recently, however, Mr. Rae continues, English capitalists have either become less circumspect and prudent, or else American owners of mining properties have grown more ingenious and plausible, for the eagerness of the former to purchase such properties is only equalled by the readiness of the latter to part with them. He refers fully to the report of the "United States Geological Exploration of the Fortieth Parallel," compiled for the Secretary for War, and observes that full and minute information respecting the mineral districts of Nevada are contained in that valuable and handsome volume. Writing in it about the White Pine district generally, and the Eberhardt Mine in particular, Mr. A. Hague says that though "described as a ledge or true 'fissure' vein, and held under laws that apply to that form of deposits," yet this "is a matter concerning which intelligent men hold conflicting opinions." Mr. Hague's own opinion is that the White Pine Mines are mere arbitrary deposits of silver ore, deposits which are sometimes of marvellous richness, but are, as a rule, fluctuating and uncertain in character. The deposit is probably the most remarkable occurrence of horn silver on record, but the average of the yield per ton has fallen to 8*l.* Mr. Rae very truly remarks that money is not scarcer in America than in Australia. In both countries mining industry flourishes. When a company cannot be formed in either Melbourne or San Francisco to develope a particular mine, the reason is that, in the opinion of those best capable of arriving at sound conclusions, the terms of purchase are too onerous, or the prospects of success are infinitessimal. The ore may be very rich, yet the cost of labour may be disproportionately high. Difficulties inseparable from working the mine, difficulties which those only who are personally acquainted with the locality can thoroughly appreciate, may deter all prudent and well-informed persons from having any pecuniary share in it.

With regard to the favourable indications presented by the properties to be sold Mr. Rae does not question that they are all that could be desired, but he explains how these indications are neutralised by other considerations. An experienced and trustworthy English miner, he says, who crosses the ocean to inspect and report upon the mine may be fully justified in giving a glowing account of its position and prospects, and in stating that the representations made as to its richness are neither ill-founded nor overstrained. On the strength of this independent and impartial report English capitalists may think themselves fortunate in securing possession of such a property at any price. For a brief period everybody will be satisfied. The vendor will congratulate himself upon having exchanged a glorious uncertainty in the form of problematical gold or silver underground for an absolute and pleasing certainty in the form of a handsome balance at his bankers. The shareholders, believing in the promises of future cent. per cent. dividends, will refuse to part with their shares except at large premiums. The general public, in its anxiety to secure an interest in the good thing of which they hear such brilliant tales, will readily buy the shares at any premium which may be demanded. Probably a satisfactory dividend, and it might be added when the purchase price is large more than one, is declared very soon after the transfer of the property.

Foreign and colonial mines, which have been sold for a large sum, frequently enter the Dividend List with wonderful rapidity. Judicious vendors of doubtful concerns leave behind them some reserves which may instantly become available. Indeed, it is a common condition of the sale of mines that the vendor is to be paid his price partly in cash and partly in paid up shares, these shares not being transferable till a 10 per cent. dividend at least has been declared. Obviously it is the vendor's interest to secure an early payment of the minimum dividend. Moreover, the speedy payment of it proves of great service to him. He can not only get rid of his shares, but he will dispose of them to the greater advantage on account of the excitement caused by the apparent success of the company. Once he has ceased to have any interest in the mine it matters nothing to him should the first dividend prove the last. The knowledge should be more widely diffused throughout England that in Australia and the United States, as in Cornwall itself, the best and safest mining enterprises remain in the hands of local capitalists, who thoroughly know their business, and who seldom, if ever, allow a really sound mining investment to leave the country.

Whether the volume be read for pleasure or for profit it will well repay perusal. A very large proportion of the information is such as can be turned to pecuniary advantage by those who have, or are likely to have, business dealings with Americans, whilst the whole of it is so thoroughly interesting and attractive that, though one may have nothing to gain from the study of it, there will be no regret that it has been read.

* "Westward by Rail: a Journey to San Francisco and back, and a Visit to the Mormons." By W. F. RAE. Second edition, with a new introductory chapter. London: Longmans.

"THE WORKMAN'S MANUAL OF ENGINEERING DRAWING."—The utility of a practical knowledge of drawing to the working engineer has been so often pointed out, that the only remaining question is with regard to the readiest mode of obtaining the knowledge. To determine the relative merits of the several manuals which have from time to time been published for the use of students would be extremely difficult, it is, therefore, usually preferable to depend upon the name of the author, and consider the purpose for which the book has been written. In the present case the title sufficiently explains for what class of students the work has been written; and as the author is Mr. JOHN MAXTON, engineer, the instructor in engineering drawing at the Royal School of Naval Architecture and Marine Engineering at South Kensington, little doubt need be entertained as to the lucid manner in which the instructions are given, especially as there are nearly 350 woodcuts and seven plates to facilitate the explanations. Every necessary detail is given as to the choice of boards, squares, instruments, scales, colors, drawing and tracing papers, and so on, to the production of a finished drawing. The work, which is published by Messrs. Lockwood and Co., of Stationers' Hall-court, and admirably printed, is altogether well adapted to the wants of those engaged in engineering, and desirous of acquiring a knowledge of drawing likely to prove useful to them in their business.

WESTERN CHRONICLE OF SCIENCE.—The August number of this magazine contains an excellent article on Machinery for Dressing Ores, and an interesting account by Mr. Worth of the Building Stones of Devon and Cornwall. The Chronicles of Science, notices of Scientific Societies, Local Diary, &c., are of the usual character.

ACCIDENTS AND THEIR TREATMENT.—A valuable little pamphlet by Mr. ALFRED SMEE, F.R.S., surgeon to the Bank of England, has just been issued by the Accident Insurance Company. It contains ample instructions for the prompt treatment of accidents and other emergencies before the arrival of medical aid. A more valuable contribution to medical literature could not be conceived, because so much depends upon judicious treatment of wounds, &c., while waiting for the surgeon. Nearly sixty cases of injury are here advised upon, and in addition a series of notes are given, in which many excellent me-

dicines, disinfectants, &c. are prescribed. The company deserves much commendation for issuing to those of the public connected with it so useful a code to keep by them.

FOREIGN MINING AND METALLURGY.

The metallurgical industry of Belgium may now be said to be in a flourishing condition. Pig, merchants' iron, and plates are all taken off as fast as they can be produced. The second fusion foundries, the boiler works, &c., are also in full activity. Prices are firmly supported, pig being quoted as follows :—Casting, No. 5, 3*l.* 14s. per ton, with a scale of 2s. per number ; pig for rails, 2*l.* 12s. per ton ; white pig for merchants' iron, 3*l.* to 3*l.* 2s. per ton, according to qualities ; first-class iron in bars, No. 1, 6*l.* 12s.; ditto, No. 2, 7*l.* 4s. per ton ; ditto, No. 3, 7*l.* 16s. per ton ; ditto, No. 4, 8*l.* 12s. per ton. Ordinary plates have made 9*l.* 4s. per ton ; boiler-plates, 10*l.* per ton ; and extra plates, 12*l.* 16s. per ton. An association of Belgian wagon manufacturers has obtained a contract for 500 trucks for the Northern of France Railway. The Belgian General Railways Working Company has also received important orders from Hungary and Germany, as well for locomotives as for carriages and trucks ; the prices are stated to be remunerative. The Turkey in Europe Railways Company has ordered 400 carriages and trucks from the Belgian Railway Plant Company and the Morlanwelz Company. The principal Belgian rolling-mills are anticipating some fresh orders for the end of the present season. The Mons Chamber of Commerce in its annual report expresses an opinion that the course of foreign events induces hopes of a great revival in the Belgian iron trade. The report adds, however, that it is impossible to deny that uneasiness has been occasioned by the want of minerals and the inadequate means of transport existing.

At Havre 70*l.* per ton has been paid for 30 tons of Chilian copper in bars, good marks, Paris conditions. At Marseilles, Spanish has made 72*l.*; refined Chilian and Peruvian, 76*l.*; rolled red copper, in sheets, 80*l.*; ditto in rounds, 84*l.* per ton. The German markets present a favourable appearance. The industrial life of Germany is being resumed in a remarkable manner, and orders are flowing into the industrial establishments of the country. At Rotterdam prices of copper have remained about stationary. There has been little doing in tin upon the French markets ; prices have presented scarcely any change. The German tin markets have remained firm. At Rotterdam there have been no very great transactions in tin ; Banca is quoted at 80 fls., and disposeable Billiton at 78¾ fls. Lead has experienced little change ; a fair amount of business has been passing upon the German markets. There has also been rather more firmness in zinc upon the German markets.

The French iron trade has not presented this week any very striking feature. In the Haute-Marne pig has been very firm. Pig for re-casting purposes has been quoted at 4*l.* 4s. to 4*l.* 8s. per ton in warehouse at the works ; mixed pig is worth 3*l.* 16s. to 4*l.* per ton. Iron remains without change. The Meurthe offers its pig at 2*l.* 16s. 10d. per ton. The Moselle (Longwy) has realised 3*l.* per ton for good qualities. From St. Dizier there are general complaints that the orders received are limited, and that affairs are in a stagnant state. On the Paris market, where the greater part of the pig of the Champagne group is generally disposed of, there is considerable dulness, notwithstaneing offers at the advantageous rates of 4*l.* 4s. to 4*l.* 8s. per ton. The French Construction Workshops are stated to be pretty well employed. A contract for 800 trucks for the Upper Italy Railway has recently been let to the establishments at Lyons and Paris. The boiler manufactories and forges are also generally assured employment. The Cail Company has added to the number of its workpeople, and has actively resumed working operations. The dividend of the Commentry Collieries and Fourchambault Montlugon, Torteron, and Imphy Forges and Foundries Company has been fixed for 1869-70 at 1*l.* per share, half payable April 15, 1872, and the remaining half payable Oct. 15, 1872.

The collieries of the French departments of the Nord and the Pas-de-Calais are now in full activity, the production not being quite able to keep pace with the requirements of consumption. Orders flow in freely, notwithstanding the dearness of coal, the high freights prevailing, and the difficulty experienced in procuring transport materiel. The Loire Mines Company has been paying this month a dividend for 1870 at the rate of 1*l.* 8s. per share.

As regards the Belgian coal trade it may be noted that a good current of orders prevails in the Charleroi basin, but means of transport continue to make default to a deplorable extent. Important contracts for coke have been concluded this week for establishments in the Grand Duchy of Luxembourg, the Eastern of France Railway, and works in Alsace and Lorraine. The basin of the Couchant-de-Mons continue to receive sustained orders for coal on French and Belgian account ; but in the absence of full supplies of rolling stock it is impossible to execute all the French orders received, a circumstance which, of course, involves considerable injury to all concerned. Stocks, by reason of the difficulties attending deliveries, are increasing, and are stated to be nearly twice as large as they were in the autumn of 1870. The position of the Mons basin is truly unfortunate. Never has the crop of beet root been more abundant, but boats and trucks have made default just when they were most wanted. The funeral of M. Godefroid-Goret, President of the Charleroi Coal Association, has just taken place at Châtelat, in the presence of a large "assistance ;" all the coal basins of Belgium were represented on the mournful occasion. It appears from the annual report of the Mons Chamber of Commerce that the production of coal in Belgium last year increased, as compared with 1869, to the extent of 772,224 tons, although the production of 1869 was 150,000 tons larger than that of 1866, which was an exceptional year. The Hainaut produced 10,196,530 tons last year against 9,884,533 tons in 1869, showing an increase in 1870 of 312,000 tons. In this increase the Mons basin sustained the largest share, 264,250 tons. The past year appears to have been a good one for the working classes, some increase of wages having been noticed in the Couchant de Mons, and a still greater increase in the Centre. The Belle-Vue Colliery Company at St. Laurent (Liége) has been paying this month a first dividend for 1871 of 16s. per share.

THE SLATE TRADE IN AMERICA.

In a recent article we called attention to the value of slate as a material used in the arts, and to the consequent importance of a supply sufficient to replace the rapidly disappearing timber, whose place it must soon occupy. Day by day this becomes more apparent ; and, consequently, it must be gratifying to our readers to learn that the growing development of our slate production promises to set at rest for ever all doubts in regard to the supply being equal to the demand. In several parts of the country we find deposits of slate of excellent quality and abundant quantity ; the most notable localities, perhaps, being in the States of Virginia, Vermont, and New York. The Virginia slate is chiefly green and purple, and is admirably adapted to all ordinary uses, while the quarries in Vermont and the northern parts of New York yield not only green and purple slate, but also a variety of a rich red colour, which, when artistically combined with the other varieties, adds greatly to the rich and unique beauty of the structure into which they enter.

During a recent visit to the quarries of Vermont we were struck with the extent of the slate industry, and the enterprise with which it is carried on. In the region of country lying between the foot of the Green Mountains and the Hudson River there are, probably, not less than 100 quarries, all being actively worked, and producing in great variety roofing slate, materials for mantels, tiles, sills, window caps, billiard table beds, &c. At many of the quarries the workmen employed form settlements of respectable size, and in their wake have followed stores, churches, and all the concomitants of a country village. Most of the workmen employed are Welsh and Irish, and form a hardy and industrious though a somewhat independent community. The machinery employed is frequently quite extensive, being frequently driven by water power derived from the numerous mountain streams that traverse the region, though in some cases, as at the Eagle Quarries, near Hydeville, steam is employed. The latter quarry and the works connected with it are of great extent, and the machinery is very perfect. In regard to the latter we may note, in passing, that it would, no doubt, astonish those who have not been accustomed to see such operations to find that the machines used are very similar to those employed for working wood and iron. Planers of nearly the same kind as those used in machine shops, though carrying a different kind of cutter, are used for planing off the slabs used for billiard table beds, mantels, tiles, &c. ; and the same kind of band and jig saws that have been frequently illustrated in the *Technologist*, and are used by workers in wood, are employed for cutting out the fine curves that give grace to mantels and similar articles with irregular forms. This fact is an important one, and should be borne in mind by those to whom an opportunity for employing slate may occur, since it shows the comparative ease with which it may be worked into complex forms, and the consequent adaptability of this material to new and hitherto unthought of uses. During our visit to the works of the Eagle Quarry we saw what is probably the largest block of slate ever worked into a finished form. It is designed for the pedestal of a cemetery monument, and when finished will, no doubt, present an elegant as well as a massive appearance. This block was worked out without the use of those special appliances required for the working of marble, granite, and other hard stones, and consequently at a cheaper rate. This fact, however, does not prove that slate is less durable than many other kinds of material used for such purposes. After being properly seasoned slate becomes considerably harder, and loses its liability to splinter and disintegrate ; and as the acids and salts contained in rain-water do not affect it as they do marble, it is free from one important disadvantage. In the region to which we have just alluded the supply of slate seems to be inexhaustible. Many of the quarries have been worked to great depths, and have been carried under the hills by means of tunnels which resemble those excavated in mining regions, giving to the whole works an appearance such as we do not usually associate with mere quarries. Indeed, the business of slate-quarrying is a peculiar one, and demands special skill and education ; and this point furnishes a satisfactory explanation of the comparative slowness with which our slate industry has been developed. Talking of the extent to which these tunnels have been excavated reminds us of a curious fact which occurs in some of them. Even in the hottest summers, ice remains in them in large blocks until late in the fall, even though the mouth of the excavations open freely to the atmosphere. An explanation of this circumstance would not, however, be difficult. Much of the slate in this region is of great purity, and is admirably fitted for what may be called in this connection manufacturing purposes. Occasionally we find crystals of pyrites and veins of hard calcareous and silliceous matter. The latter occur in curious veins, that have produced in the slabs an appearance very much resembling what are known as ripple marks. So much so, indeed, that the popular opinion is that they are ripple marks. This hypothesis is, however, dispelled by the fact that these so-called ripple marks have none of the regularity of the true article, but correspond precisely with the veins of foreign matter. These veins were doubtless infiltrated into cracks in the semi solid clay, such as we see in the bottom of a pond when it dries up ; and afterwards, when the whole stratum dried and was subjected to pressure, the clay contracted more than the foreign matter, which thus protruded from the surface of the layer in the form of so-called ripple marks.—*Technologist* (New York).

FOREIGN MINES.

GLASGOW AND CAPE BRETON (Nova Scotia, Coal and Railway).—Under date August 8 the manager, Mr. Gisborne, advices that the stopes driven on the coal at the "Reserve" are down 110 and 30 ft. respectively ; the railway is being rapidly pushed on, and should it be available for traffic as far as the Reserve during November next, he would be in a position to ship a dozen cargoes and supply Sydney with from 2000 to 3000 tons of household coal

DON PEDRO NORTH DEL REY (Gold).—Copy of telegram from Lisbon :—Weighed to July 29, 12,553 oits. ; estimate for July, 14,553 oits.

CHONTALES.—In advices dated July 27, Mr. Belt states that the system on which he is working all the mines is to take advantage of the natural configuration of the ground, and attack them from the valleys on their strike. The explorations are commenced by levels driven at a slightly higher horizon than the stamps. When the level has 10 or 15 fms. of backs a rise is made to surface, and another level commenced above it. The lode is thus thoroughly explored, and the exploratory works form permanent outlets for the ore when found. The ore from the upper level is thrown down the rise, at the bottom of which is a shoot, for filling the wagons that go direct to the stamps. The same tramway serves for Trinidad, San Benito East, and San Benito West, and another for Consuelo and San Sebastian. No further expenditure of capital is required for San Benito West. The tramway at San Benito East will be completed next month, without additional expenditure of the new capital. For projected works at 10 fms. deeper he estimates a cost of 100*l.* In the new deep cross-cut at San Antonio there are 60 fms. to drive, the cost to complete which is estimated at 500*l.* After expending 70*l.* more at Santo Domingo the mine will either pay its way or be not worth prosecuting. San Sebastian can be put in working and self supporting order for 425*l.* The total estimated expenditure on the mines (including 205*l.* for contingencies) will be 1300*l.*, which will open out the mines to give a supply of 4000 tons of ore per month. To treat this ore he proposes to change 12 of the present stamps to square stamps, and to erect 24 additional ones. The aggregate proposed outlay on new machinery is 470*l.*, making 600*l.* with the 130*l.* for expenditure on the mines. He thinks it would be prudent to provide a capital of 1000*l.* He engages that mine cost, machinery, repairs, management, and other general expenses for the 4000 tons shall not exceed 2400*l.* per month. The ore averages 5 to 7 dwts. The expenditure will be covered by 4½ dwts., and 7 dwts. will leave a profit of 1450 per month ; they will doubtless fall in with much richer patches. Under date July 6, Mr. Belt writes : —In consequence of very wet weather and a scarcity of labour, we only got 602 tons of ore to the stamps during the past month. Our cost, however, was $1200 less than last month, but our management and general cost could not be reduced in proportion, the saving being entirely in labour. The 602 tons of ore yielded 273 ozs. of gold, average produce 9 dwts. per ton, value $3503, say 700*l.* Our total cost has been $4234, say 847*l.*, which includes the sum of $959, or 192*l.*, expended on new tramways and machinery. The returns will naturally be augmented as soon as the new tramway to the San Benito Mines is completed, the prospects of which are such as to promise large returns when the means of transporting the ore with stamps are carried out. Mr. Belt reports, on the departure of the mail, that native labourers were fast returning to their occupation at the mines. With regard to the health of the establishment, the extreme wet weather had produced more than the usual sickness amongst the natives, but the European staff was in good health.

MINERAL HILL (Silver).—The directors have received the following telegram :—"Letters will have informed you of stoppage of mill from want of water. Nevada suffering from the greatest drought ever known on this coast. Water-pipes very nearly completed, and mill starts again next week. Mines looking quite as well or better than in April, rich ore on dumps, piles largely increasing in quantity, new mill in forward state, and progressing rapidly—all right."

SNOWDRIFT (Silver Mining and Reduction).—The directors have submitted two specimens of argentiferous galena taken from the box of ores at their offices, Finsbury-circus, to Prof. White, whose assay is :—No. 1, argentiferous galena, 70·2 per cent. lead, and 1487 ozs. 18 dwts. 22 grs. silver per ton ; No. 2 argentiferous galena, 74·2 per cent. lead, and 1407 ozs. 18 dwts. 16 grs. silver per ton. One of the directors of the company is now in the United States, whither he has gone to make final arrangements with the vendors.

PACIFIC.—The directors have received the following telegram :—"Commenced crushing yesterday. Assay Buel North Star worth $527 per ton." The annexed is an extract from Capt. Prideaux's letter, dated Aug. 4 :—"The stopes are yielding daily 1 ton of first-class ore, worth over $300 per ton, and a quantity of second-class ores, worth from $50 to $120 per ton. We are preparing to work some new stopes, which will be proceeded with as soon as possible."

SWEETLAND CREEK.—Mr. G. Maclean, the manager, under date July 27, writes—"We are fairly under weigh for another run, with good prospect for returns. The creek is working finely, the improvements adding much to its appearance as well as usefulness."

— July 30 : Melted proceeds of run, making four bars, weighing 805 ozs., and at our estimate of $19 per oz. worth $15,295. We are fairly under weigh for another run, with fair prospect for returns. Creek is working finely, the improvement adding much to its appearance as well as usefulness. The tunnel is now in 135 ft., making 11 ft. for this week, with a probability of 13 or 14 ft. being driven next. I have been employed all day superintending the construction of a water-blast for ventilating the tunnel, clearing out smoke, &c. The tunnel is progressing, perhaps, as well as could be expected driven from one point. The rock at present is not at all unfavourable. I think we are on the second seam laid down in the diagram sent you, and if so it is not as good as where it crosses the Red Hill tunnel ; but this can readily be accounted for by the difference in rock upon all strata at different points. I am now almost persuaded to continue the tunnel on its present course for 550 ft. further, or until we intersect the main seam of the hill—the third one laid down upon your diagram, and the same that the upper end of the present tunnel, for 700 or 800 ft., was run on. By this plan we would account all of our hardest rock on the start for the distance named, and then have a seam which we know extends the course desired to the face of the bank on the channel, and covers three-fourths of the whole length of the channel. This seam, when reached, can be run 1 ft. per shift, and at a cost of from $6 to $8 per foot. By driving for this inside, or main, seam the tunnel will be much straighter, and better located with reference to the dirt we washed along the course of the tunnel ; and at no time before reaching the seam would the rock cost more than $20 per foot, but often not more than $10 or $12.

PINTO.—J. C. Slater, July 31 : I have no particular change to note in the appearance of the company's mines since my last letter, except the Michigan, which has developed a fine body of ore, traceable on the surface for 300 ft., the vein being narrow at present, but widening as we go deeper. The Maryland continues to look well, but I have not been raising much ore, for the reasons stated in my last letter ; and, unless your instructions are positive to the contrary, shall continue my present plan of developing the mine, and placing it in condition for rapid and profitable working when the tunnel shall have been completed. We are making good progress with the tunnel, which is now advanced 140 ft. from opening. The contractors are working well and energetically on the mill.

UTAH (Silver).—J. Nancarrow, July 31 : I wrote you on the 24th, and told you that we had began to smelt ; we carried on for three days, and then had to shut down again and new line the furnace with fire-brick, which will take till the middle of the week to complete ; this we could not foresee ; when we begin again we shall have a good run. In the mine the lodes are looking well, and I am pleased to tell you the bottom is very good ; so much for Janins' opinion. We have now to build a house to put the charcoal in, which is coming in very fast, but it must be got under cover before the snow comes on. Give us a little time, and we are to have one of the first properties out ; you need not fear for the result, my mind is set upon making it such as none of you need be ashamed of. I sent you a telegram on Saturday. All is going on straight at this mine. All I want is time and some money to make this one of the best paying mines here. We have ordered all the necessary castings for the two new furnaces, and we have ordered the stone, brick, &c., &c. ; these will be got on at once ; we shall not spare time or expense to get them about. The directors must not be very anxious about the mines, for I am better satisfied with the property every day. We have had it surveyed, and in a few days the patents will be asked for. This will take about four months to be completed. We shall not have any trouble about them, for we have our titles made as clear as can be. I will write you again in a day or two. I mentioned in my last for you to send me money—we have the lawyer's bill to pay ; also all the new works What are we to do with the bullion?

EXCHEQUER (Gold and Silver).—Aug. 1 : During the week ended Saturday last about 8½ tons of good ore were brought to surface. The rise is 57 ft. up from the 140, and the ledge has been stoped 15 ft. by 17 ft. ; water is decreasing. I have some dead work to do before I can get into the ore schute I found in the Old Tunnel ; but will commence taking out ore from this stope on Friday or Saturday. The north drift from the 140 is now in 51 ft., and ought to be pushed ahead beyond C, and 100 ft. further along the ledge. I omitted to mention that a severe thunderstorm and land slide have destroyed part of the flume which conveys water to the boiler of engine ; it may cost $100 to repair.

CAPE (Copper).—Captain Williams, July 7 : Ookiep : The engine-shaft during the past month has been sunk 1 fathom 3 inches, in a good course of copper ore, worth 18 *l.* per fathom for the length of the shaft, 10 ft. by 6 ft. wide. The shaft is now 4 fathoms 3 in. below the 48 fathom level.—Smelting Works : Blast-furnace continues profitable, but reverberatory experiments are still incomplete, and not yet profitable. Accounts of profit and loss on both furnaces from January 1 to June 1 promised for next mail.—Railway : Engines expected to be on the road again in a day or two ; traffic carried upon the line by mules ; Mr. Hall expects that by the middle of August he will begin to receive at the upper terminus about 1000 tons per month.—Returns : Yield from Ookiep 482 tons. Spectakel, 112 tons. Transport to Port Nolloth, 490 tons of ore, and 140 tons of regulus ; to Hondeklip, 137 tons of ore. The Lynwood, with 360 tons of ore, has arrived at Swansea. Bills of lading are received for 112 tons of regulus and 15 tons of ore, shipped per steamers.

ALIMILLOS.—Aug. 16 : The lode in the 60, west of San Rafael, has improved within the past few days, yielding ¾ ton per fathom. In the 60, east of San Francisco, the lode is composed of quartz and fine spots of lead, of a very kindly appearance. The lode in the 60, west of the same, is very poor at present. In the 50, east of Magdalena, the lode is small, and the ground very hard. The 75, east of Taylor's engine, is opening out very fair tribute ground, yielding 1½ ton per fathom. The lode in the 50, west of San Yago, is large, and contains a little lead, but not enough to value. In the 30, east of San Victor, the lode fluctuates considerably ; it is not so productive at present, yielding ½ ton per fathom. The lode in the 20, east of Addis's, contains occasional stones of lead. In the 20, west of the same, the lode continues very regular, producing ½ ton per fathom. In the 40, east of Crosby's, the lode is more productive than it has been for some weeks past, and shows good indications for a further improvement, yielding 1½ ton per fathom. We have met with a small cross-cut in the 50, east of Crosby's, which appears to have disturbed the lode. The 50, west of Crosby's cross-cut, is passing through a very fine lode, yielding 2 tons per fathom. In the 30, east of Henty's, the lode has decreased in size, and has become quite poor. The lode is small and poor in the 20, east of Swaffield's.—Shafts and Winzes : Very little has been done in San Andrianos shaft, below the 60, for the past fortnight. Fair progress is being made with San Victor shaft, below the 40. Rey's winze, below the 40, is being sunk west of San Yago shaft, to ventilate the 50. The lode in Jaen's winze, below the 40, is split into branches, yielding ½ ton per fathom. Henry's winze, below the 20, is very much the same as when last reported on, producing ½ ton per fathom.

LINARES.—Aug. 16 : Pozo Ancho : The lode in the 85 fm. level, west of Crosby's shaft, is compact and regular, and of a promising appearance, yielding 1½ ton per fathom. In the 75, of the same, the lode is very open, and yielding fine lumps of ore, yielding 1 ton per fathom. The lode in the 75, west of San Francisco, is small and poor ; but in the 75, east of the same, the lode is large and strong, and of a kindly appearance, yielding 1½ ton per fathom. The lode is falling off in the 65, west of San Francisco, yielding ½ ton per fathom. In the 55 of the same lode is small, containing a little lead, but not enough to value. There is no improvement in the 45, east of San Francisco.—Los Quinientos : The 65 fm. level, east of Taylor's engine-shaft, is quite unproductive ; and the 65, west of the same, is hard and poor, and the lode is also small, and of no value in the 55 of the same shaft. The lode in the 55, east of the same, is still large, yielding fine lumps of ore, producing ½ ton per fathom. In the 45, east of Addis's, the lode is small, ground hard for driving ; and the lode in the 32, of the same, is large, but at present of no value. In the 32, west of Henty's, the lode is disordered, and of little value. There is not anything in the 32, east of Henty's, to value. The 32, west of San Carlos, occasionally yield stones of lead ore. The 45 fm. level, of the same, is hard and poor at present. In the 45, east of San Carlos, the lode has fallen off very much in value since last report, yielding ½ ton per fathom.—Shafts and Winzes : San Carlos engine-shaft, below the 45 fm. level, will reach the required depth for a 55 fm. level by the end of this month. The lode in Martin's winze, below the 32, is small and poor at present. In Salvador's winze, below the 32, the lode is regular and compact, looking kindly, yielding ½ ton per fathom. Granero's winze, below the 32, is yielding a little ore, but not enough to value. The lode in Carmona's winze, below the 55, is large, consisting of quartz and lead ore, yielding ¾ ton per fathom.

FORTUNA.—Aug. 16 : Canada Incosa : The men in the 120 fathom level, east of O'Shea's shaft, are now cross-cutting north towards the part of the lode on which Awar's winze was sunk, and the men in the 110, west of Henty's, are stoping a part of the bottom of the level. The lode in the 100, of the same, is a little smaller than it was, but is still of a promising appearance, yielding 1½ ton per fathom. There is no change worthy of notice in the 90, south of the same. The ground in the 60, west of San Pablo's, is moderately easy for driving, and the lode divided into branches, yielding 1 ton per fathom. In the 60, east of San Pablo's, the lode is unproductive. The lode in the 90, east of Addis's, is large, consisting chiefly of quartz and carbonate of lime, with good stones of ore, yielding 1 ton per fathom. In the 80, west of Lowndes', the ground is hard for driving, and the lode poor. The 80, east of the same, is opening fairly productive tribute ground, yielding 1½ ton per fathom.—Shafts and Winzes : Carro's shaft, below the 70, is down to the 80, and will be holed in a day or two. Pedro's winze, below the 50, is now in a poor bar of ground, yielding ½ ton per fathom. Dolores' winze is holed, affording good ventilation to the 60. We have begun sinking Judd's shaft below the 90, towards the 100.—Los Saldos : The lode a few days ago, in the 110, west of Buenos Amigos, was of a productive and promising appearance, but has failed since, yielding ½ ton per fathom. In the 100, of the same, the lode is compact and strong, yielding 2 tons per fathom. The 90, west of San Carlos, is opening moderately profitable tribute ground, yielding 1½ ton per fathom. The lode in the 75, of the same, is disarranged, and quite unproductive. The 110, east of Buenos Amigos, is a small, compact, and regular lode, yielding 1 ton per fathom. In the 110, east of Morris's engine-shaft, the ground is hard, and the lode is small and poor. The lode in the 100, east of Cox's, is unproductive at present, but we are expecting it to improve daily. The 25, west of Palgrave's, has diminished very much both in size and value, yielding ½ ton per fathom.—Shafts and Winzes : There is a small branch in Palgrave's engine-shaft, below the 25, but we do not think it is the main lode, yielding ½ ton per fathom. The lode in San Miguel's shaft is now in the shaft, and the men are making great dispatch in sinking it, yielding 3 tons per fathom. In San Pablo's shaft, below the 90, the lode is not so productive as it was, yielding 1 ton per fathom. The lode in Jorge's winze, below the 90, is, although small, very compact and firm, yielding 1½ ton per fathom. Carlo's winze, below the 75, is holed to the 91, greatly improving the ventilation. The tribute department yielded very well in the past month, and the stopes are looking much as usual at present. The machinery and all other surface works are in a very satisfactory condition. We estimate the returns for August at 350 tons.

PESTARENA UNITED (Gold).—T. Roberts, J. Mitchell, J. Roberts, T. Warne : The gold obtained for the month of July was 541 ozs. 8 dwts. 2 grs. from 737½ tons of ore.—Mines : Val Toppa : We are continuing the driving of the cross-cut west in Zero level through highly mineralised rock. In the level above No. 1 we have cut through a small lode in the cross-cut west, and have set to drive north on it, estimated to yield 3 tons per fathom, at 12 dwts. per ton. The end driving south on the western part of the quartz lode, in No. 1 level, 6 tons per fathom, at 12 dwts. per ton. The end north of the cross-cut is poor ; a winze sinking behind this end is producing 10 tons per fathom, worth 12 dwts per ton. No. 4 cross-cut east is still on the flat lode, yielding 4 tons per fathom, worth 10 dwts. per ton. The intermediate end between Nos. 2 and 1 levels, on the side north, is producing 8 tons per fathom, worth 15 dwts. per ton, and the intermediate end on the great quartz lode is producing 10 tons per fathom, worth 15 dwts. per ton. All the stopes on the new and flat lodes are without any material change. We have a large force of men raising ore to test second wire-rope.—Peschiera : The end driving north in the 33, on No. 5 lode, is yielding 2 tons per fathom, worth 10 dwts. per ton. The end driving north, on No. 2, in this level, is yielding 3 tons, worth 17 dwts. per ton ; and the stopes in the back are producing 5 ton, worth 16 dwts. The stopes in the bottom of the 46, on this lode, is yielding 5 tons, worth 17 dwts. per ton. The Aquarius whim-shaft is now opened to the 33, and during this week we shall commence to fix timber for the skip-road from the 23 to the 33.

RHINE (Rhenish Prussia).—Aug. 22 : Schmelzer : The sinking of Henty's shaft has been recently somewhat slower, as the shaft is going through the Toni lode, and the ground is heavy.—Schmelzer Lode : The north-west end is for the time suspended, and the men put to drive a cross-cut north towards Bleibtreu's shaft, to hole ; holing will be effected to an old cross-cut driven 3 fms. south from the bottom of Bleibtreu's. About 2½ fms. must be driven, 1 fathom of which is already done ; 7 to 8 ft. of ground stands between the two levels, which we hope to communicate by borer-hole within ten days. Bleibtreu's shaft has been cleared and secured 13½ fathoms from surface, and deep enough to see all the old bottom levels, which, being half full of water, we shall not be able to examine till we have holed and let down the water. There are drivings, I observe, north-west and south-east from Bleibtreu's, on the Schmelzer lode, and since our north-west level has gone off some 5 or 6 fms. from this shaft it would seem there are two lodes, or that the Schmelzer has split into two parts ; it remains to be seen if we have been driving on the main part of the lode.—Marienfreude : The water in south shaft has so much increased that it is impracticable to drain it by hand-pumps ; the shaft is, therefore, suspended till we have completed the arrangement for pumping with the engine.

[For remainder of Foreign Mines see to-day's Journal.]

SILVER AND LEAD IN INDIA.—Mr. V. T. Taylor, officiating collector of Bhagalpore, seems to have made a useful discovery, or rather rediscovery, of some lead ore in the Sahran Pergunnah of his district. It was first discovered five years ago by some Koles, who were digging for iron ore. Samples of the lead were forwarded by a native trader to Mr. Metcalfe, then deputy magistrate at Banka, who sent them on in his turn to Government. What the Government did or said on the occasion Mr. Taylor could not ascertain ; but evidently no steps were taken to test the metal until Mr. Taylor revived the subject in May last. In consequence of his report, the Bengal Government forwarded the samples to Dr. Oldham, of the Geological Survey, for his inspection. He pronounced them to be true galena, or sulphide of lead, which generally contains about 86 per cent. of the pure ore. They were also found to yield 32½ ozs. of silver to the ton of lead, a proportion which would make the ore highly valuable if it occurred in any quantity, seeing that in England it pays to separate only two ounces in the ton. Dr. Oldham naturally declined from small hand specimens to form an opinion as to the quantity of lead ore found by Mr. Taylor, the nature of the lode containing it, or the ease with which it might be extracted. But if the vein on which Mr. Taylor stumbled be of any extent, its neighbourhood to the new Chord Line ought to commend it to the further notice of the Government.—*Allen's Indian Mail.*

SUBTERRANEAN GAS LIGHTING.—There is nothing more rude than the lighting of mines by candles stuck with a dab of clay to the caps of the workmen, or placed between two slender blades making a fork at the end of a stick. To supersede such clumsy modes of illumination nothing seems more feasible than to force gas through pipes, and substitute the broad blaze of a burner for the flickering flame of the greasy wick. No success seem to have attended the several methods hitherto proposed of doing this ; but new plans are being suggested from time to time which may give greater promise, and therefore be sooner adopted than those now known. One of the latest projects includes a new application of steam, and has at least the merit of simplicity. An indirect current secured by a steam-jet carries the gas into a pipe, by which it is conducted to the subterranean locality where the light is needed. A receiving vessel is provided in such locality, and with this vessel the lower end of the pipe connects, entering through the top thereof. The temperature of the vessel is sufficiently low to condense the steam, which is carried off by a siphon pipe, while a pipe extending from the upper part of the receiver connects with the burner. That any method of lighting mines by gas will be adopted, at least for a long time to come, is doubtful, but that it would add much to the tranquillity with which mining operations can be carried on is more than likely.—*American Artisan.*

AWARDED TWENTY GOLD AND SILVER FIRST-CLASS PRIZE MEDALS.

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TO MINERS, IRONMASTERS, MANUFACTURING CHEMISTS, RAILWAY COMPANIES, EMERY AND FLINT GRINDERS, McADAM ROAD MAKERS, &c., &c.

BLAKE'S PATENT STONE BREAKER,

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FOR REDUCING TO SMALL FRAGMENTS ROCKS, ORES, AND MINERALS OF EVERY KIND.

This is the only machine that has proved a success. This machine was shown in full operation at the Royal Agricultural Society's Show at Manchester, and at the Highland Agricultural Society's Show at Edinburgh, where it broke 1¼ ton of the hardest trap or winstone in eight minutes, and was AWARDED TWO FIRST-CLASS SILVER MEDALS. It has also just received a SPECIAL GOLD MEDAL at Santiago, Chili.

It is rapidly making its way to all parts of the Globe, being now in profitable use in California, Washoe, Lake Superior, Australia, Cuba, Chili, Brazil, and throughout the United States, and England. Read extracts of testimonials:—

The Parys Mines Company, Parys Mines, near Bangor, June 6.—We have had two of your stone breakers in use during the last 12 months, and Capt. Morcom reports most favourably as to its capabilities of crushing the materials to the required size, and its great economy in doing away with manual labour.
For the Parys Mining Company,
H. R. Marsden, Esq. JAMES WILLIAMS.

Weston Emery Works, Manchester.—We have used Blake's patent stone breaker made by you for the last 12 months, crushing emery, &c., and it has given every satisfaction. Some time after starting the machine a piece of the moveable jaws (about 20 lbs. weight, chilled cast-iron, broke off, and was crushed in the jaws of the machine to the size fixed for crushing the emery.
H. R. Marsden, Esq. THOS. GOLDSWORTHY & SONS.

Alkali Works, near Wednesbury.—I at first thought the outlay too much for so simple an article, but now think it money well spent. WILLIAM HUNT.

Welsh Gold Mining Company, Dolgelly.—The stone breaker does its work admirably, crushing the hardest stone and quartz. WM. DANIEL.

Our 15 by 7 in. machine has broken 4 tons of hard winstone in 20 minutes, for fine road metal, free from dust. Messrs. ORD and MADDISON, Stone and Lime Merchants, Darlington.

Kirkless Hall, near Wigan.—Each of my machines breaks from 100 to 120 tons of limestone or ore per day (10 hours), at a saving of 4d. per ton. JOHN LANCASTER.

Ovoca, Ireland.—My crusher does its work most satisfactorily. It will break 10 tons of the hardest copper ore stone per hour. WM. G. ROBERTS.

General Frémont's Mines, California.—The 15 by 7 in. machine effects a saving of the labour of about 30 men, or $75 per day. The high estimation in which we hold your invention is shown by the fact that Mr. Park has just ordered a third machine for this estate. SILAS WILLIAMS.

Your stone breaker gives us great satisfaction. We have broken 101 tons of Spanish pyrites with it in seven hours.
H. R. Marsden, Esq. EDWARD AARON, Weston, near Runcorn

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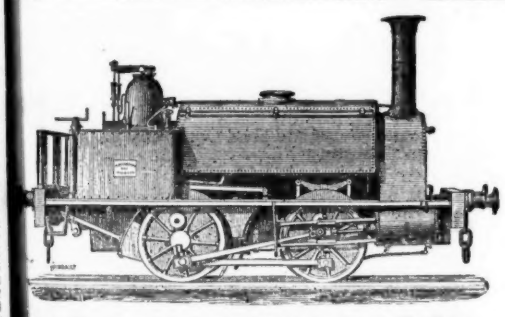

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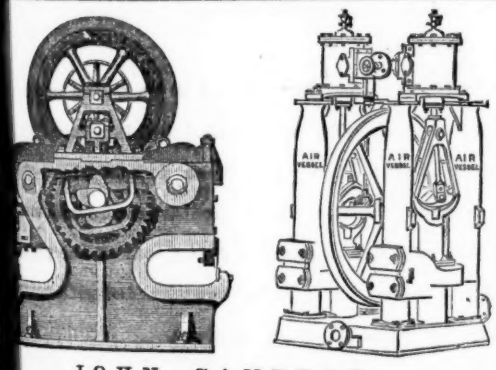

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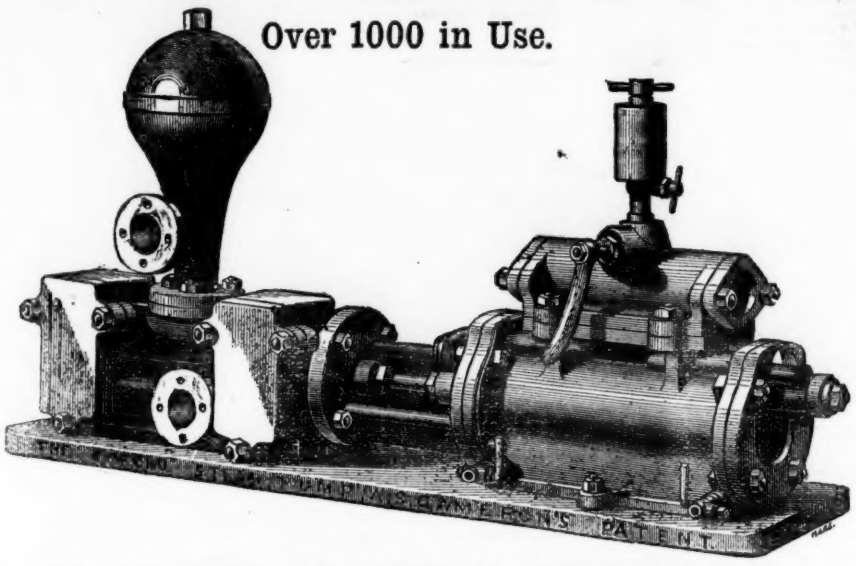
Whiffen, Thomas, Battersea	1	„
Jones, W., and Co., Middlesborough...	4	„
Jarrow Chemical Co., South Shields..	1	„
Richardson, J. G. and N. H., Jarrow-on-Tyne	1	„
Read, Holliday, & Sons, Huddersfield	1	„
Sheldon, Nixon, and Co., West Jarrow	2	„
Tennant, C., and Co., near Newcastle.	7	„
Webb, H., & Co. (Manure), Worcester	1	„
Union Chemical Company, Stratford..	1	„



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Requires NO Shafting, Gearing, Riggers, or Belts.

All Double-Acting.

Works at any Speed, and any Pressure of Steam.

Will Force to any Height.

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Can be placed any distance away from a Boiler.

Occupies little space.

Simple, Durable, Economical

IN USE AT THE FOLLOWING COLLIERIES:—

Adelaide Colliery, Bishop Auckland	3	Pumps.	North Bitchburn Colliery, Darlington	2	Pumps.	Stott, James, and Co., Burslem	1	Pump
Acomb Colliery, Hexham	1	„	Newton Cap Colliery, Darlington... ...	1	„	Seaton Delaval Coal Company, near Newcastle	1	„
Blackfell Colliery, Gateshead	1	„	Normanby Mines	1	„	Thornley Colliery, Ferryhill	1	„
Black Boy Colliery, Gateshead	1	„	Oakenshaw Colliery	1	„	Thompson, John, Gateshead	2	„
Castle Eden Colliery	2	„	Pease's West Colliery	2	„	Trimdon Grange Colliery	1	„
Crofton, J. Ct., near Ferryhill	1	„	Pease, J. and J. W., near Crook	5	„	Tudhoe Colliery	4	„
Carr, W. C., Newcastle	4	„	Pease, J. and J., Brandon Colliery ...	1	„	Vobster and Mells Colliery	2	„
Etherley Colliery	1	„	Pegswood Colliery, near Morpeth ...	2	„	Widdrington Colliery, Morpeth	2	„
Gidlow, T., Wigan	3	„	Pelton Fell Colliery	1	„	Whitworth and Spennymoor Colliery ...	3	„
Haswell, Shotton, and Easington Coal Co. ...	2	„	Railey Fell Colliery, Darlington	1	„	Westerton Colliery, Bishop Auckland ...	1	„
Lochgelly Iron and Coal Company ...	1	„	Right Hon. Earl Durham, Fence Houses	1	„	Wardley Colliery, Gateshead	1	„
Leather, J. T., near Leeds	2	„	Skelton Mines	1	„	Westminster Brymbo Coal Company ...	2	„
Lumley Colliery, Fence Houses	1	„	South Benwell Colliery	4	„	Weardale Coal and Iron Company ...	5	„
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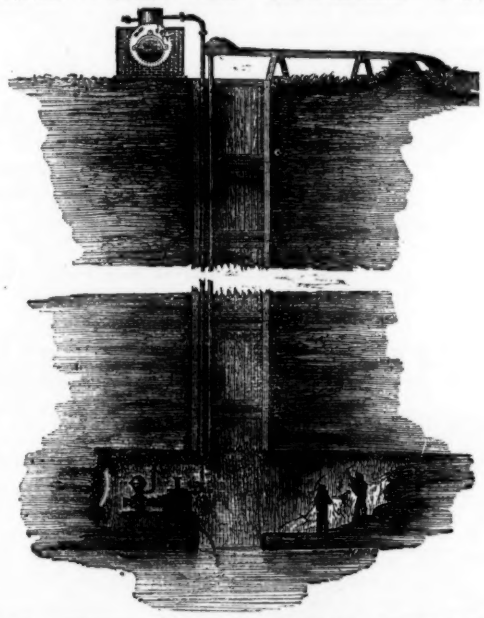
IRONWORKS AND ROLLING MILLS:—

Bede Metal Company, Jarrow	11	Pumps.	Gilkes, Wilson, Pease, and Co, Middlesboro'..	2	Pumps.	Whitwell and Co., Stockton	3	Pump
Bagnall, C. and T., Grosmont Ironworks	2	„	Lloyd and Co., Middlesborough	1	„	Whessoe Ironworks, Darlington	1	„
Consett Ironworks	2	„	Solway Hematite Iron Company, Maryport ...	1	„	West Cumberland Hematite Iron Company ...	1	„
Castleford Foundry Company, Normanton	1	„	Vaughan, Thomas, Middlesborough	2	„	Westbury Iron Company	1	„
Ellen Rolling Mills, Maryport	1	„	The Shotts Iron Company, Edinburgh	1	„			

THE "SPECIAL" STEAM PUMP AS APPLIED FOR DRAINING MINES.

The arrangement in the accompanying illustration shows an economical method of draining mines without the expense of erecting surface-engines, fixing pump-rods, or other gearing. A boiler adjacent to the pit's mouth is all that is necessary on the surface; from thence steam may readily be taken down, by means of a felted steam-pipe, to connect the pump with the boiler. The pump may be placed in any situation that may be convenient for working it, and connecting the steam, suction, and delivery pipes.

These engines can be fixed and set to work in a comparatively short time, and also at a very small outlay. They are used in large mines as auxiliary engines, and will be found invaluable adjuncts in all mining operations.



To estimate the quantity of water to be raised by any given size of pump refer to the tabulated list below. It is recommended to use long-stroke pumps where the height exceeds 100 ft., so that the largest result may be obtained with a minimum wear and tear of the pump pistons and valves. The pumps are provided with doors for ready access to all working parts.

PRICES OF THE "SPECIAL" STEAM PUMPS.

Diameter of Steam Cylinder .....inches	2½	3	4	4	6	6	6	7	7	7	8	8	8	8	10	10	12	12	14	16	26
Diameter of Water Cylinder ....inches	1¼	1½	2	4	3	4	6	5	6	7	4	6	7	8	6	7	8	10	8	7	6½
Length of Stroke..... .....inches	6	9	9	12	12	12	12	12	12	12	12	12	12	18	12	12	18	24	48	24	72
Strokes per minute	100	100	70	50	50	50	50	50	50	50	50	50	50	35	50	50	35	—	—	—	—
Gallons per hour	310	680	815	3250	1830	3250	7330	5070	7330	9750	3250	7330	9750	13,000	7330	9750	13,000	—	—	—	—
PRICE.....	£10	£15	£20	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100	—	—	—	—

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